

I F F C O - K A L O L - U N I T

PLANNING SECTION
MAINTENANCE DEPARTMENT
REPORT NO.13/1992

R E P O R T

O N

P L A N T T U R N A R O U N D - 1 9 9 2

- (A) AMMONIA PLANT STOPPED FOR SHUTDOWN JOBS (0620) - 03-11-1992
UREA PLANT STOPPED FOR SHUTDOWN JOBS (0620) - 03-11-1992
- (B) WASTE HEAT BOILER 101-CA TUBE FAILURE DURING - 17-11-1992
PLANT START UP (2015) - 24-11-1992
- (C) REFORMER LIGHT UP - 29-11-1992
- (D) AMMONIA PRODUCTION LINED UP (1840) - 29-11-1992
AMMONIA PLANT BACK END SHUTDOWN (1920)
DUE TO FAILURE OF 103-J
- (E) AMMONIA PRODUCTION LINED UP (2115) - 03-12-1992
AMMONIA PLANT BACK UP END STOPPED (0130) - 05-12-1992
DUE TO FAILURE OF 103-JAT - 04-12-1992
UREA PRODUCTION STARTED (0705) - 05-12-1992
UREA PLANT STOPPED DUE TO AMMONIA PLANT S/D (0130)
- (F) AMMONIA PRODUCTION LINED UP (2015) - 07-12-1992
UREA PRODUCTION STARTED (1130) - 08-12-1992
- (G) AMMONIA PLANT SHUTDOWN DUE TO SYN.GAS COMPRESSOR - 12-12-1992
HP CASE (1025) - 12-12-1992
UREA PLANT SHUTDOWN DUE TO AMMONIA PLANT S/D (1025)
- (H) AMMONIA PRODUCTION LINED UP (1715) - 26-12-1992
UREA PRODUCTION STARTED (2035) - 27-12-1992

INDIAN FARMERS FERTILISER CO-OPERATIVE LIMITED

I N D E X

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P R E F A C E

IFFCO - KALOL was facing problem of high pressure drop of 3.5 kg/cm² across secondary reformer catalyst bed as well as high secondary reformer outlet temperature. The catalyst of this vessel (103-D) was in service since May 1986. The L.T.S. catalyst was also due for replacement. Apart from this, there was a problem of seal oil leakage in the refrigeration gas compressor (105-J). The plant had been in continuous operation since March 1991 except for a forced shutdown in the month of June 92 (73 hours) due to power failure and during month of July 1992 (15 days) due to shortage of HCl in the water treatment plant resulting out of transporters strike.

It was decided to take a planned shutdown from 3rd Nov, 1992 to 22nd Nov, 1992 for executing the above critical jobs. M/s.PDIL Sindri, and inspection team from Aonla were arranged for carrying out ultrasonic and eddy current scanning of reformer catalyst tubes respectively and M/s.M.H.Dettrick, Calcutta was called for inspection and repair of secondary reformer catalyst supporting dome.

Various agencies for supplying of manpower, hydrojetting of heat exchangers, opening and box up of heat exchangers in Ammonia and Urea plants, replacement of conveyor belts in bagging plant, providing protective epoxy coating on the concrete flooring, and repair of acid/alkali proof brick lining in the bulk effluent tanks were arranged. In Urea Plant, commissioning of hydrolyser plant was taken up. Maintenance of Electrical installations was done. Electrical motors and MCCs were overhauled. Instrument panels, controls etc were checked and preventive maintenance was done.

The major plant shutdown jobs were completed by 16th Nov, 1992 and plant start up activities commenced. During the start up, we faced a tube failure in one of our waste heat boilers 101-CA on 17-11-1992. (See attached Annexure - A) Immediately plant was shutdown and job of replacing tube bundle was taken in hand. On opening of top channel cover we observed some small pieces of furmanite materials on top of tube sheet at four places. This leaky tube bundle was replaced by a used spare tube bundle in which two nos of tubes were plugged, and the plant was restarted on 24-11-92 with ammonia production lined up on 29-11-92 around 6.30 P.M. Unfortunately, we faced a failure in our Synthesis gas compressor. H.P. case on 29-11-92. Failure took place during process of loading the syn gas compressor. H.P. case bearings were checked. Thrust bearing and thrust collar were found badly damaged. These were replaced. (See attached Annexure - C) Also H.P. case oil seals were attended and replaced damaged parts. Flapper of non return valve of H.P. case suction was found detached during investigation of this failure. This was the cause of failure resulting in H.P. case surge. Ammonia production was lined up on 03-12-1992. We faced a second failure on our Syn. gas compressor drive H.P. turbine (103-JAT) nozzle operating spindle on 5-12-92. (See attached Annexure - B) This was replaced and the Ammonia production lined up on 7th December, 1992. The plant was in operation at a reduced load due to low availability of gas upto 12th Dec, 1992. During this period when plant was in operation oil leak was observed from 103-J seals. On 12th December 1992 with availability of gas, increasing load on Syn. gas compressor was in progress when compressor was tripped due to high axial displacement of 103-J H.P. case at around 10.30 A.M. H.P. case of Syn. gas compressor was taken for overhauling with the assistance of BHEL Engineer who was at our site for attending 105-J seal oil leakage

problem. L.P.case was also taken for overhauling from 16-12-92 for checking the internals.

The overhauling of Syn.gas compressor H.P. & L.P. cases was completed on 24-12-1992 in all respect (12 days) and plant was put to production on 26-12-1992.During start up the governor drive gear was attended.

The planned activities of the shutdown were achieved within the scheduled time frame due to concentrated efforts and deployment of additional resources in the form of man and machineries on critical jobs of secondary reformer catalyst replacement and L.T.S catalyst replacement.However due to unforeseen problems faced on 101-CA and 103-J production could be stabilised after overcoming above problems from 26-12-1992.

Details of jobs undertaken during the above period are highlighted in the report given herewith.

----- XXXX -----

K A L O L - U N I T

THE PLANT TURNAROUNDS AT A GLANCE

YEAR	AMMONIA - PLANT				UREA - PLANT				REASON IF ANY
	P E R I O D				P E R I O D				
	FROM	TO	DOWN TIME DAYS HRS =====		FROM	TO	DOWNTIME DAYS HRS =====		
1975	06-05-75	21-05-75	16	-	06-05-75	21-05-75	16	-	Planned
1976	26-03-76	20-04-76	26	-	26-03-76	26-03-76	26	-	Planned
76-77	05-12-76	22-01-77	49	-	05-12-76	24-02-77	51	-	101-JT B/D
1978	21-02-78	15-03-78	23	-	21-02-78	25-03-78	31	-	101-BJ B/D
1979	21-05-79	12-06-79	23	-	21-05-79	12-06-79	23	-	K-1101/2, 3rd Stg. Cylinder
1981	12-04-81	10-05-81	29	-	08-04-81	12-05-81	35	-	101-B (Plan Headers
1984	01-01-84	25-01-84	25	-	01-01-84	25-01-84	25	-	Planned
1986	19-03-86	03-05-86	45	-	04-03-86 <i>19.03.86</i>	01-05-86 <i>3.5.86</i>	59	-	Reformer Revamping
1987	12-04-87	03-05-87	21	-	12-04-87	02-05-87	20	-	Planned
1988	18-04-88	14-05-88	27	-	18-04-88	13-05-88	26	-	Planned
1990	05-02-90	05-03-90	29	688.67	31-01-90	07-03-90	35	829.0	Planned
1991	24-02-91	13-03-91	18	429.08	23-02-91	14-03-91	20	459.25	Planned
1992	03-11-92	26-12-92	54	1282.91	03-11-92	27-12-92	55	1310.25	Planned

PLANT - TURNAROUND - NOVEMBER - 1992

GENERAL - DETAILS

SR.NO.	C A T E G O R Y	QUANTITY
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Equipment Utilised :

A) IFFCO :

65 T	HM Crane	01
15 T	Coles Crane	01
18 T	Tata Crane	01
03 T	Forklift	02
01 T	Forklift	01
	Truck	01
	Tractor - Trolley hired to replace of LTS catalyst	01

B) IFFCO - MANPOWER :

a)	Mechanical)	
b)	Mechanical Services)	
c)	Electrical)	Existing
d)	Instrument)	strength
e)	Trainees in various trade)	

C) HIRED - CONTRACTOR

Sr.No.	Category	Mandays
01	Milwright Fitter	86
02	Fitter	740 1/2
03	Fabricator/Grinder	99
04	Rigger	694 1/2
05	Welder NIBR	88
06	Carpenter	58
07	Manson	23
08	Semi Skilled labour	521

D) HIRED - IFFCO TIME OFFICE :

Labour unskilled	3718 MAN DAY
Ex-Trainees	(3/11 To 26/11/92)

MAIN MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

SR NO.	WO.NO & DATE	JOB DESCRIPTION	NAME OF PARTY	AREA
1	2	3	4	5
01	D-8589	INSPECTION OF SECONDARY REFORMER DOME	M/S.DETRICK,CALCUTTA	M(A)
02	D-8592/B 29/5/92	BHEL ENGINEERS FOR 102-JT GOVERNING SYSTEM OVERHAUL & CHECKING OF 105-JHP SEAL ENGINEER FOR GOV.SYSTEM & ENGINEER FOR H.P.SEAL	M/S.BHEL,H'BAD SHRI B.V.N.REDDY SHRI K.P.RAO	M(A)
03	D-8272 11/7/92	MANPOWER SUPPLY	M/S.TECHNO ENGG.WORKS BHARUCH	PLNG
04	D-8275 06/6/92	HEAT EXCHANGER COVER OPENING AND BOX UP	M/S.TECHNO ENGG.WORKS BHARUCH	PLNG
05	D-8274 01/01/92	HYDROJETTING OF H/E	M/S.NUTECH JETTING EQUIP. PVT.LTD.,NEW DELHI	M(P)
06	D-8281 09/04/92	INSULATION	M/S.LLOYDS INSULATION BOMBAY	PLNG
07	D-8510 18/5/92	OVERHAULING OF PLATE HEAT EXCHANGER	M/S.ALFA LVEL,BARODA	M(U)
08	D-8506 18/4/92	OVERHAULING OF RELIEF VALVE	M/S.MOORCO INDIA LTD. MADRAS - BARODA	M(U)
09		101-CA TUBE BUNDLE RECPT.	M/S.CEDCO TECH,BARODA	M(A)
10	D-8668/B	COOLING TOWER HEADER & ELBOW REPLACEMENT	M/S.CEDCO TECH,BARODA	M(O)
11	D-8698	RAILING OF HCL TANK	M/S.GANDAJI & ASSOCIATES BARODA	M(O)
12	D-8680	PAHARPUR SERVICES FOR COOLING TOWER WOOD WORK	M/S.PHARPUR COOLING TOWERS,BARODA	M(O)
13	D-8758 22/5/92	NAPHTHA TANK ROOF REPLACEMENT - (I) BARRICAKING (II) TANK ROOF	M/S.CEDCO,BARODA	M(B)
14	D-3845 16/10/89	REPAIRING WORK OF BLANKET INSULATION OF CONVECTION ZONE H.T.SECTION	M/S.LLOYDS,NEW DELHI	M(A)
15		115-C TUBE EXPANDING HYDROJETTING & HYDROTEST	M/S.ANUP ENGG.,A'BAD	M(A)

SR NO.	WO.NO & DATE	JOB DESCRIPTION	NAME OF PARTY	AREA
1	2	3	4	5
16	E-2042 31/10/92	128-C REMOVAL OF OLD AND FIXING OF NEW 128-C	M/S.CEDCO TECH,BARODA	M(A)
17	E-2042 31/10/92	115-C OPENING OF CHANNEL COVER & TO PULL OUT TUBE BUNDLE & BOX UP (AFTER CLEANING BY OTHER AGENCY)	M/S.CEDCO TECH,BARODA	M(A)
18	E-2042 31/10/92	131-JC --- DO -----	M/S.CEDCO TECH,BARODA	M(A)
19	E-2042 31/10/92	105-CA TO REPLACE TOP SIDE GASKET	M/S.CEDCO TECH,BARODA	M(A)
20	E-2042 31/10/92	101-CA REPLACEMENT OF TOP GASKET	M/S.CEDCO TECH,BARODA	M(A)
21	E-2417 09/9/92	ACID/ALKALI PROOF LINING IN EFFLUENT TANK & DUST REMOVAL PLANT ON TERRACE OF EMPTY BAG STORAGE	M/S.CHEMISIGHT ENGINEER,BARODA	CIVIL
22	E-0447 12/9/92	REMOULDING OF EXISTING MAIN EFFLUENT CHANNEL OF LAGOON PHASE "B"	M/S.AMI BUILDERS AHMEDABAD	CIVIL
23	D-8339 02/9/92	BITUMASTIC LINING ON CONVEYOR GANTRY	M/S.CHEMISIGHT ENGINEERS,BARODA	CIVIL
24	D-8338	ACID/ALKALI PROOF LINING WORK IN WEAK EFFLUENT TANK AND WATER TREATMENT	M/S.MADHUSUDHAN CO,A'BAD.	CIVIL
25	D-8330 17/9/92	EPOXY MONOLITHICK PLASTER AND COATING ON CONCRETE SURFACE OF PACKER SCALE	M/S.WESTERN ALLIANCE ENGINEERS,BOMBAY	CIVIL
26	D-8174 17/1/92	SERVICES OF QUALIFIED OPERATOR TEAM FOR CARRYING OUT ULTRASONIC FLOW DETECTION	M/S.NDT SERVICE	INSP.
27	D-8175 21/1/92	ULTRASONIC SCANNING OF REFORMER CATALYST TUBES	M/S.PDIL,SINDRI	INSP.
28	D-8945 04/6/92	SERVICING OF MINIMUM O.C.B.	M/S.BHEL LTD	ELECT
29	D-8947/B 10/6/92	SERVICING OF AIR CIRCUIT BREAKER	M/S.VOLTAS LTD	ELECT
30	E-0095/B 07/2/92	LIFTING OF MINIMUM O.C.B. AT 66 KV YARD	M/S.A.E.CO.,LTD	ELECT

SR NO.	WO.NO & DATE	JOB DESCRIPTION	NAME OF PARTY	AREA
1	2	3	4	5
31	D-8949 14/12/92	SERVICE OF AIR CIRCUIT BREAKER	M/S. SIEMENS LTD	ELECT
32	D-8946/B 27/12/91	SERVICING OF MINIMUM O.C.B. AT 11 KV	M/S.KIRLOSKAR SYSTEM LIMITED	ELECT
33	D-8948/B 17/2/92	SERVICING OF AMF SET	M/S.GREAVES COTTON & CO.	ELECT
34	D-1078 E-2435	PAINTING OF SILO TRANSFER TOWER GROUND 1ST,2ND & 3RD FLOOR PRILL TOWER TOP	M/S.B.CHAUHAN & CO KALOL	CIVIL
35	-	EDDY CURRENT TESTING OF REFORMER TUBES	IFFCO ADNLA	INSP
36	-	OPERATORS FOR CRANE/FORKLIFT	IFFCO KANDLA	W/S

PLANT TURNAROUND - NOVEMBER - 1992

AMMONIA PLANT

MECHANICAL JOBS

11

JOB CODE JOB DESCRIPTION

01 01 01 AIR COMPRESSOR TRAIN :

- (A) Air compressor turbine 101-JT : Taken for overhauling.
Following jobs were done.
- 01 Removed the inlet and exhaust pipes and oil lines connected to turbine.
 - 02 Removed the governor assembly and top casing cover.
 - 03 Rotor was found in good condition.
 - 04 All interstage labyrinths were found having increased clearances. Hence were replaced with new ones.
 - 05 All the diaphragms from upper and lower halves of casing were removed for cleaning.
 - 06 Markings due to erosion were found on split faces of diaphragm Nos. 3,4,5 & 6. Diaphragm No.3 & 4 were repaired by welding on split faces & subsequent grinding/fitting. While diaphragms No. 5 & 6 were replaced with repaired diaphragms available as "Spare" in stores.
 - 07 Erosion was also found on diaphragm locating portions in lower & upper halves of casing. However no repair was carried out on these portions.
 - 08 Rotor was positioned on bottom half of the casing & bottom and rear gland as well as interstage labyrinth clearances were checked. Also shroud clearance and blade platform clearances were checked.
 - 09 Checked inboard and outboard journal bearings and thrust bearing assembly. Found in good condition, resembled the same. Axial float was found to be 0.009".
 - 10 Positioned the top casing and tightened the casing bolts.
 - 11 Replaced / fixed the exhaust, inlet pipe lines and other oil lines connected to casing.

JOB CODE

JOB DESCRIPTION

- 12 Removed turbine locating keys in front end cleaned them and again replaced.
- 13 Checked the clearances below floating washers of casing holding down bolts which were found O.K.
- 14 Lubricated all linkage of nozzles bar assembly.
- 15 All R.O's & governing oil lines were cleaned.
- 16 Checked for oil leakages after starting lube oil circulation.
- 17 Turbine was checked for its OST & it was found to have tripped at 7650 rpm on local panel.
- 18 Vibrations of inboard and outboard bearings after overhauling were checked and found to be normal.

(B) AIR COMPRESSOR GEAR BOX :

Gear box of air compressor was opened for inspection. Following were the observations.

- Gear & pinion teeth were found okay.
- Pinion shaft bearing clearances were checked and found to be as follows.
 - North side - 0.23 MM
 - South side - 0.21 MM
 - Axial float - 0.63 MM
- Gear shaft bearing clearances were checked & found as follows.
 - North side - 0.21 MM
 - South side - 0.19 MM
 - Axial float - 0.28 MM

Clearances found were within acceptable limit hence the gear box was assembled back with the same bearings.

(C) AIR COMPRESSOR - LP STAGE :

LP case north side bearing was opened for the complaint of high housing vibrations. Its journal bearing pads were found damaged hence all pads were replaced. Also tapping was done in threads for housing bolts. All 8 No. allen bolts were replaced by long studs.

JOB CODE

JOB DESCRIPTION

(D) AIR COMPRESSOR H.P. CASE :

As a preventive maintenance check up this compressor was taken for overhaul. Following jobs were carried on the compressor.

01. Removed top casing.
- 02 Rotor was found in good condition. However rusting was noted on rotor shaft at 6th stage due to moisture carry over from the intercooler 130-JC.
- 03 Checked the inter stage labyrinth clearances which were found in order.
- 04 Rotor assembly was taken out and both rotor as well as casing halves were cleaned thoroughly manually and with air to remove all dust particles and rust products.
- 05 Rotor was positioned on the bottom half of the casing and again the interstage labyrinth clearances were checked.
- 06 Journal bearing clearances and axial float of rotor with and without thrust pads was checked and found as follows.
 - North side journal - 0.005" ~ 0.006"
 - South side journal - 0.005" ~ 0.006"
 - Axial brg.clearance - 0.008"
 - Total axial float - 2.55 mm
- 07 Checked oil leakages after starting the lub oil pump.
- 08 Checked the vibration levels on both the journal bearings and thrust bearings after loading of the compressor and were found normal.

01 01 02 N.G.COMPRESSOR TURBINE - 102-JT :

Following jobs were done.

NG Compressor drive turbine's governing oil system was taken for overhauling & calibration. Following were the observation.

- (i) ESV spindle was found bent
- (ii) Oil leakage through HP Servomotor spindle & bottom flange.

JOB CODE	JOB DESCRIPTION
(iii)	The thrust bearing found damaged & Control slide Top disc got detached from its slide in Right side LP Servomotor.(LP2) Oil leakage through the main piston spindle.
(iv)	The seal kit was found deteriorated in left side LP Servomotor(LP1)
(v)	Turbine rear oil gland clearances found more resulting oil leakages through the gland.
(vi)	Accelerator lever found detached from its locating pin inside the amplifier.
(vii)	Oil leakage through the hand wheel column spindle and the flange was observed due to damage to the seating of NR Injection Valve.

Following actions were taken.

- (i) ESV spindle was replaced by a new one with old cone.
- (ii) H.P.Servomotor overhauled and oil leakages arrested by replacing the damaged seals & "O" rings by new ones.
- (iii) LP2 Servomotor overhauled and Control slide & thrust bearing was replaced by new ones.
- (iv) LP1 Servomotor overhauled and seal kit was replaced by new ones.
- (v) Turbine rear oil gland seals were replaced by new ones and maintained min clearances of 0.15 mm.
- (vi) Accelerator lever was removed as the same was not required for operation.
- (vii) NR Injection Valve handwheel column seat was machined & lapped. Same was assembled back. Oil inlet & drain lines were air blown.

After completion of the above jobs, the governing system was calibrated and results are enclosed in Annexure - I.

Following results were obtained after overhauling.

Finally, NG turbo Compressor was rolled at 9.30 hrs on 17/11/92 and speed raised up to 9500 rpm. Minimum Governor speed found at 8500 rpm.

While operating the handwheel column of the LP Injection Valve, the spindle broke at the neck (near the bearing) and the bearing also found damaged.

JOB CODE JOB DESCRIPTION

Hence the unit was manually tripped at 9500 rpm and handweel column was taken out for manufacturing a new spindle at IFFCO Workshop.

The handweel column was finally assembled with a new spindle & new bearing and set was made ready for operation by 19.00 hrs on 17/11/92.

During the above operation of the unit on 17/11/92 from 9.30 hrs to 11.30 hrs. the Performance of the machine was found smooth upto 9500 rpm including the W/W governer take overspeed of 8500 rpm)

A N N E X U R E - I
GOVERNOR CALIBRATION VALUES

Injection Controller Postion	HP	Valve lift mm	LP1	Valve lift mm	LP2	Valve lift mm
	Pressure Kg/cm2		Pressure kg/cm2		Pressure kg/cm2	
Zero Injection	1.5	0	< 1.5	-	< 1.5	-
	1.7	2.0	1.6	1.0	1.6	1.0
	4.5	16	3.95	17.5	3.95	18.0
Max.Injection	< 1.5	-	1.5	0	1.5	0
	< 1.5	-	1.6	1.0		
	1.5	0	3.1	12	3.1	12
	3.3	10	4.5	22	4.5	22

01 01 03

SYNTHESIS GAS TURBINE - 103-JAT:

103-JAT was taken for major overhauling during shutdown. Following jobs were done.

1. Decoupled 103-JAT from 103-JBT and JLP. Removed all lube oil connections and leak off steam lines wherever necessary.
2. The thrust was found as 0.60 mm and the thrust ring was found damaged. White metal lining on the journal bearing on JLP side was found pealed off.

JOB CODE

JOB DESCRIPTION

- 13 Clearance of thrust bearing after changing of thrust shoes = 0.55 mm.
 Thickness of old thrust shims = 6.05 mm
 Thickness of new thrust shims = 6.33 mm

Thrust found after boxing up the bearing cover = 0.16mm which is very low.

Thrust shims thickness was again reduced by 0.06 mm. Now, thickness of thrust shims = 6.27 mm.

Boxed up the bearing cover finally.
 Final thrust = 0.20 mm.

- 14 HP steam governing valve was overhauled as it was not operating smoothly. Both the valve spindles part No.623 and bearing bushes part No.646 were replaced. The governing valve was boxed up after proper adjustment. Governing valve bolts were tightened at 3200 psi with SELECT A TORQUE tooling. Inlet steam flange bolts were tightened at 3200 psi with new gasket. The exhaust line was boxed up.
- 15 The JBT, JAT, JLP & JHP were coupled after checking the alignment and the readings were recorded in the Annexure-II.

TTV OVERHAULING :

Again plant was started but still high axial shift remained on 103 JHP and hence, the plant was again stopped for major overhauling of 103 JHP & 103 JLP. During this period, TTV of 103 JAT was opened because it was found detached, after the plant was stopped.

Following were observed during its overhauling:

1. Screw spindle (Part No.44) had come out of its split coupling (Part No.18).
2. Screw spindle collar had completely being chipped off and bearings part No.63 were damaged and were found in pieces.
3. Latch-up lever (Part No.42), trip hook (Part No.41) and knife edge where latching is done were found worn out.
4. Ball bearings (Part No.51) and (Part No.25), needle bearings (Part No.35) and (Part No.104) were found damaged.

JOB CODE

JOB DESCRIPTION

Following parts were repaired/replaced and the TTV was reassembled and replaced into position.

Repairs:

- a) Screw spindle Part No.44.
- b) Trip hook Part No.41
- c) Latch up lever Part No.42
- d) Coupling split Part No.18

Replacement:

- a) Trip hook shaft Part No.103.
- b) Bearings - Part Nos.51,25,63,105 & 35.
- c) Split washer Part No.61
- d) Spares Part No.62
- e) Spring Part No.38

Nozzle Operating Gear Overhauling:

While attending 103 JAT TTV an allen bolt was found in steam chest of 103 JAT, hence, again nozzle operating gear was completely removed from its position to check the condition of tack welds of all allen head bolts of gland housing of spindles. One number of allen bolt was found missing from gland housing which was traced from the steam chest.

Both the spindles and nozzle bar were removed. All allen head bolts of gland housing were replaced with new ones and again the whole assembly was boxed up. Proper tack welding of allen head bolts was done to the gland housing cover. The complete nozzle operating gear was taken to its position and boxed up.

After linking it with PRC-12, the lift of PRC-12 against air signal pressure was checked and found as follows:

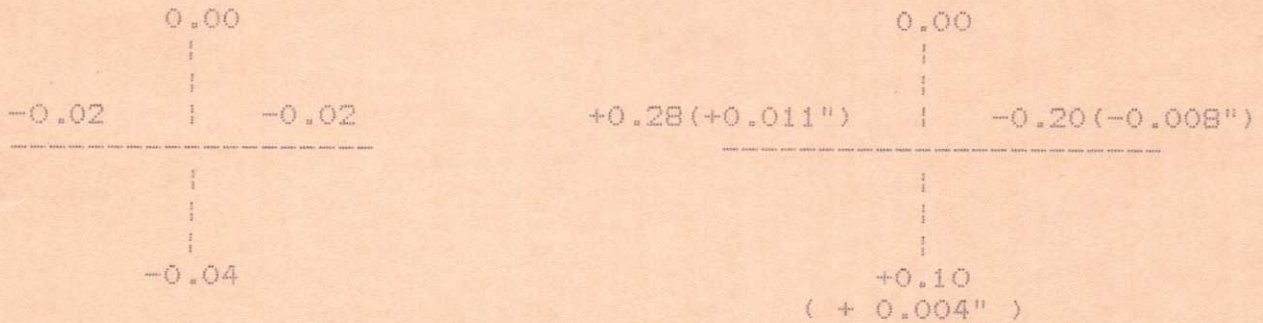
<u>Air pressure</u>	<u>Lift of PRC-12 spindle</u>
3 psi	0 mm
6 psi	6.5 mm
9 psi	56.5 mm
12 psi	104.0 mm
15 psi	149.0 mm
A-14	

JOB CODE

JOB DESCRIPTION

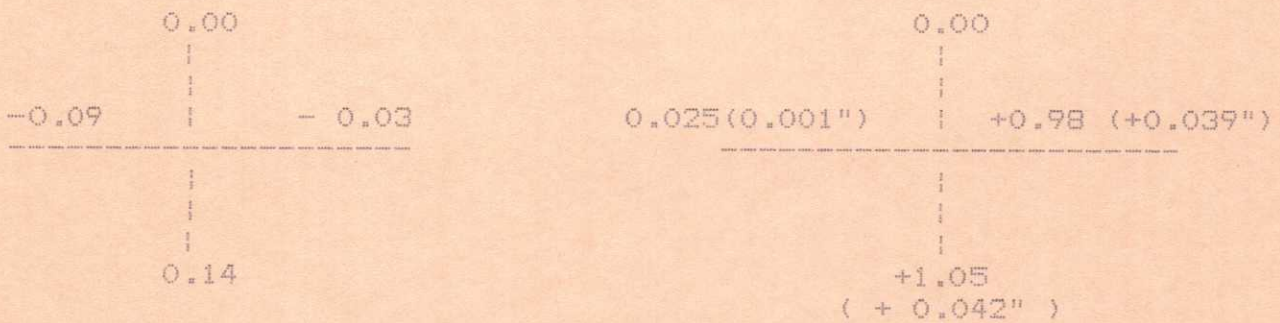
A N N E X U R E - IIAlignment Readings between JBT & JAT:

Dial Tip on JAT Coupling hub.



All dimensions are in MM.

Alignment between JAT & JLP:



All dimensions are in MM.

JOB CODE JOB DESCRIPTION

SPARES CONSUMED:

CODE NO.	PART NO.	DESCRIPTION	CONSUMED QUANTITY	STORES BALANCE
104921	288	288 THRUST BEARING	01	01
		JOURNAL BEARING ASSEMBLY FOR JLP SIDE	01	
	212	212 RING (LABYRINTHS)	07	NIL
	146	146 RING (GLAND BOX)	01	01
	147	147 RING -DO-	01	01
	148	148 - DO -	01	01
	149	149 - DO -	01	01
	150	150 - DO -	01	01
	433	433 RING	02	02
	234	234 RING	02	02
	803	803 SOCKET HEADED CAP SLEEVE FOR GLAND BOX.	06	NIL
	623	HP GOVERNING VALVE SPINDLE	02	
	646	HP GOVERNING VALVE BRG. BUSH	02	

01 01 04

SYNTHESIS GAS TURBINE - 103-JBT:

During 103 JLP & 103 JHP overhauling, while checking gauge glasses oil outlet lines of all bearing/couplings etc., some metallic debris was found in the gauge glass below 103 JBT governor.

Hence, the governor of 103 JBT was removed to inspect the glass etc. of the governor drive assembly. The governor drive assembly was found intact. However, the shaft of over speed trip assembly at coupling position was found eroded. The same was repaired by using Devcon's 05 minute putty. The governor drive coupling was replaced with new one. Also the key of driving hub of the coupling was replaced and the governor drive assembly was coupled.

Again the governor assembly was put back into the position and turbine was started.

JOB CODE	JOB DESCRIPTION
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01 01 05 REFRIGERATION COMPRESSOR DRIVE TURBINE - 105 JT:

Turbine was opened for major overhauling. Following jobs were carried out during the overhauling:

1. Disconnection of nozzles, pipes, flanges etc. of the turbine.
2. Disconnection of coupling and removal of coupling and coupling guard.
3. Control links of governor were removed and the governor assembly was taken out.
4. Both front end and rear end bearing upper halves were removed. Also thrust bearing cover was removed.
5. After removal of insulation casing bolts were removed.
6. Upper half of the casing was lifted.
7. Labyrinth and shroud clearances were measured at all diaphragms.
8. Rotor was lifted and placed on rotor stand for thorough cleaning.
9. Erosion was found on diaphragm split faces and diaphragm locating areas in the casing beyond 4th stage of diaphragm.
10. Cleaned the diaphragms and rotor.
11. Checked the clearances of bearings and were found OK.
12. Diaphragms were welded and ground at split faces wherever more erosion was found.
13. After repairs on diaphragms again rotor was placed on bottom casing and all internal clearances were checked with old labyrinths. These were found OK and hence, no labyrinth was replaced.
14. Top casing of turbine was put into position and boxed up.
15. Governor and governor connecting linkages were connected.
16. Coupled turbine to LP case and placed the coupling guard into position.
17. All keys of turbine were made free for its movement during expansion of turbine.

JOB CODE

JOB DESCRIPTION

- 18 Proper clearances were maintained on floating washers of hold down bolts.
- 19 All R.D's and governing oil lines were cleaned.
- 20 After steam charging, turbine DST was checked in the decoupled condition and was found to be 7712 rpm.

01 01 06

REFRIGERATION COMPRESSOR: 105-J**L.P. CASE - 105-JLP:**

Oil was found coming in discharge of 105-J compressor during running of the plant. Hence, it was decided to open the casing of both LP & HP cases of 105-J to inspect the mechanical seal and also to overhaul the complete compressor train. Following jobs were done on 105-JLP during the shut-down.

1. Decoupled the LP case from 105 JT and 105 JR.
2. Removed the top bearing covers of both ends and top half of the bearings was also removed.
3. Casing bolts were removed and top half of the casing was also removed.
4. Labyrinth clearances were measured.
5. Rotor assembly alongwith mechanical seals, bearings, coupling hubs was removed.
6. Both the coupling hubs were removed from the rotor and both the mech. seals were also removed.
7. Seal faces as well as O'rings etc. of both the mech. seals were found OK.
8. Cleaning of all dismantled parts was completed and rotor was again placed into position.
9. All seal oil, sour oil, buffer gas and reference gas lines were cleaned thoroughly.
- 10 While fixing back all these lines, care was taken to refill the seal loop in sour oil line by oil.
- 11 Bearing clearances of both the bearings were measured and found to be 0.007".
- 12 Total axial float was measured and found to be 4.90mm.
- 13 Thrust bearing condition and clearance were found to be OK. Thrust clearance was found to be 0.009".

JOB CODE	JOB DESCRIPTION
14	Gap between second impeller (discharge side) and casing was measured for reference and was found to be 7.70 mm with rotor on active side.
15	Top casing was put into position after checking of all internal clearances.
16	Both north and south side sour oil traps and separators were removed, cleaned thoroughly and put back into position.
17	A valve was provided in separator gas outlet lines on both ends to stop siphoning of oil through it into balance line in case of leakage. This was done in consultation with Production Department.

REFRIGERATION COMPRESSOR
H.P. CASE 105-JHP:

HP case of refrigeration compressor was opened mainly to attend oil leak into the casing. Following jobs were done:

1. Rotor was decoupled and coupling hub was removed.
2. Journal bearing clearances were checked and found to be 0.004" for both the bearings.
3. Thrust bearing clearance was checked and found to be 0.015".
4. Journal bearings (top), thrust bearing, thrust collar and mech. seals were removed.
5. Casing bolts were opened and top half of the casing was removed.
6. Tip clearance between first impeller and casing was measured and found to be 0.040" instead of 0.050" as shown on drawing.
7. Rotor was removed and cleaned thoroughly.
8. Both casing halves were cleaned thoroughly.
9. All sour oil lines, buffer gas lines, reference gas lines and LP seal oil lines were removed and cleaned thoroughly.
10. Both sour oil separators and traps were opened, cleaned thoroughly & put back into the position.
11. Rotor, after thorough cleaning was put back into position and its total axial float was measured and found to be 6.08 mm.

JOB CODE

JOB DESCRIPTION

- 12 Thrust bearing shims were adjusted to get an axial float of 0.009" and the rotor position from casing at first impeller of 0.050" (i.e. required as per drawing). Following shim sizes were used to obtain the above:
- | | | |
|---------------|---|--------|
| Active side | - | 0.380" |
| Inactive side | - | 0.365" |
- 13 Mech. seal assemblies and O'rings were replaced with new ones while old seal collars which were found OK were reused.
- 14 First labyrinth after mech. seal on both ends was replaced.
- 15 Labyrinth clearances at all impeller neckrings and bushings were measured and found to be within recommended limits.
- 16 Operating lengths of both the mech. seals were measured and were found to be 2.5725" for thrust bearing side mech. seal and 2.660" for coupling side bearing against the recommended 2.59375" + 0.062".
- 17 Alignment reading between gear box and HP case was measured and recorded.
- 18 Top half of casing was put back into position and boxed up.
- 19 Both mech. seal assemblies, bearings and thrust bearings were boxed up.
- 20 Machine was coupled and made ready for start-up.
- 21 A valve was provided on both ends in separator outlet gas line to prevent carry over of oil due to siphoning in case of any oil leak.
- 22 Care was taken to refill both the seal loops with oil while refixing after cleaning.
- 23 Sour oil header and degasser tank were cleaned thoroughly to remove sludge, if any.
- 24 Tapping was given in buffer gas line to provide cooler to cool buffer gas if required in future.

01 02 01

BFW PUMP TURBINE (TERRY TURBINE) 104-JAT:

Turbine was taken for major overhauling and following jobs were done during its overhauling:

1. Turbine was decoupled from pump.

2. Turbine exhaust pipe was removed.
3. Top casing bolts of turbine were opened.
4. Governor of turbine was removed.
5. Top casing was removed.
6. Turbine bearing clearances and labyrinth clearances were checked. Labyrinth clearances were found to be OK.
7. Rotor was removed from the turbine and put on the rotor stand and cleaned thoroughly.
8. All carbon seal rings were replaced.
9. Some gear teeth of coupling hub on turbine rotor were found damaged. Hence, the complete coupling assembly was replaced with new one.
10. Labyrinth oil from oil console was removed and console was cleaned thoroughly.
11. Governor oil from Governor was replaced.
12. Gland packings of TTV were replaced and also its bonnet gasket was replaced.
13. Again turbine rotor was put into position.
14. Top casing was replaced after measurement of labyrinth clearances.
15. Again bearing clearances and axial float of the rotor were checked.
16. New lubricating oil was filled in the oil console and governor and coupling was regreased.
17. Governor valve setting w.r.t. air pressure was checked and found as follows :

<u>Air signal Pressure</u>	<u>Turbine RPM</u>
3 psi	2050
6 psi	2540
12 psi	3120
15 psi	3750

18. Turbine over speed trip test was also carried out and turbine tripped at 4100 rpm.
19. Maximum speed attainable by manual adjustment was found to be 3800 rpm.

- 20 Turbine to pump alignment reading was checked after overhauling and was found to be as follows :

	0.00		0.00
+0.05		- 0.07	
	-----		-----
	-		+
	0.03		1.33

Dial on turbine

01 03 01

I.D. FAN & ITS DRIVE TURBINE - 101-BJ/BJT:

I.D. FAN:

- 01 Both end journal bearings were opened. Their clearances were checked and found to be OK. Hence, boxed up with the same bearings.

I.D. FAN DRIVE TURBINE:

- 01 Both end journal bearing clearances were checked and found to be OK.
- 02 Thrust bearing end play was not found and hence, the condition was presumed to be OK.
- 03 Coupling greasing was done.

I.D. FAN DRIVE GEAR BOX:

- 01 Gear box top cover was opened for internal inspection.
- 02 Gear and pinion teeth condition was found to be OK.
- 03 All bearing clearances were checked and found to be OK.
- 04 Gear box oil was replaced with the new one.
- 05 After above checking, the gear box was again boxed up.

01 04 01

LUB. OIL CONSOLE - 102-J: (04.11.92 to 08.11.92)

Lub oil filters (06 Nos) replaced.
Main lub. oil console oil was drained thru centrifuge.

The bottom level oil was removed manually by buckets, mopping and sponging. The tank was cleared of hard carbonised oil with a soft scraper. Then cleaned with diesel thoroughly.

Total 30 drums were collected.

Lub. oil overhead tank was cleaned thoroughly from inside. Seal Oil overhead piping arrangement was cleaned from outside and gauge glass and platform, were also cleaned.

Main Lub. oil tank manhole gasket was replaced, as the previous gasket was worn out.

Informed about the above to production Shift Engineer and clearance was taken.

Charged FRESH LUB OIL SERUOPRIME-68 are as under:

a) L.O. drums (210 ltrs. - 30 Nos. = 6300 Ltrs capacity)

TIME FACTOR:

a) Removal of oil thru' centrifuge	08 hrs.
b) Removal of oil at bottom of tank manually by mopping and sponging.	04 hrs.
c) Cleaning of main L.O. tank & Overhead L.O. tank.	12 hrs
d) Charging fresh oil thru centrifuge	09 hrs
e) Cleaning of overhead LO tanks, gauge glasses, platform etc.	03 hrs
Total	36 hrs.

The above mentioned timings exclude breaks for lunch, tea day and connection and disconnection of hoses, manholes etc.

01 04 02

L.O. CONSOLE - 103-J: (14.11.92 TO 16.11.92)

Lub oil filters (Total Nos.84) replaced.
Lub oil was drained thru' centrifuge.

Bottom level oil was removed manually by buckets and mopping. Cleaned hard carbonised oil with a light saraper. Cleaned the tank walls, floor with diesel.

Total 24 drums were collected.

Informed Production Shift Engineer and clearance was taken.

Charged FRESH LUB OIL SERVOPRIME-32 as under :

a) Fresh oil drums of 21 Nos = Qty. 4410 Litres
210 ltrs. capacity.

04 L.O. drums (new) kept near console for top up during starting of the plant.

JOB CODE

JOB DESCRIPTION

TIME FACTOR:

a) Removal of oil thru' centrifuge	-	05 hrs
b) Removal of oil at bottom of the tank manually.	-	04 hrs
c) Cleaning of tank with soft scraper, mopping and diesel.	-	08 hrs
d) Charging new oil.	-	06 hrs
		23 hrs
Total		23 hrs

The above timings are excluding breaks for lunch, tea, and connection & disconnection of hoses, centrifuge, manholes etc.

01 12 01 PRIMARY REFORMER 101-B :

Following jobs were attended in Primary Reformer.

(A) REFORMER PENT HOUSE :

- 01 All secondary air registers made operable except following.
101,212,401,403,411,507,608,612,706 & 711
- 02 Following atomising steam valves replaced.
507,514,410,113,906
- 03 Following naphtha needle valves replaced.
613 - 1st & 2nd
- 04 Following minor leaks of naphtha were attended.
209,405,409,411,412,603,712,804,811,911,913 & 914
- 05 Following atomising steam valve gland leaks attended.
102,105,113,202,205,303,305,306,312,402,409 & 611
- 06 MIC-30 Control valve U/s drain valve replaced
- 07 Following atomising line union leaks attended.
113,201,209,210,304,406,411,501,507,514,607,705,712
804,811,913, & 914
- 08 Burner No. 703 atomising steam line pin hole leak attended.

- 09 Following burner naphtha gun seating area repaired.
113,306, & 514
- 10 All individual block valves for naphtha for each row were roused.
- 11 All naphtha guns were cleaned & refixed
- (B) REFORMER RADIANT SECTION :
- 01 Following tubes were removed & replaced on the basis of Ultrasonic / Eddy current test results and confirming defects by X-ray
109,137,818,819 & 821
Row No. 1,2,3, & 4 were scanned by Eddy current
Row No. 5,6,7 & 8 were scanned by Ultrasonic.
- 02 All weldolet to riser tube joints of each harps were found to have cracks on D.P.test. These were ground & rewelded till found OK in D.P.test & radiography.
- 03 Damaged header insulation, damaged brick lining, tunnel slabs & walls were attended.
- 04 All reformer tubes were cleaned externally by production department.
- 05 Pyroblocks were replaced wherever found damaged.
- (C) REFORMER CONVECTION SECTION :
- 01 HT & LT convection zone coils were cleaned by hydro-jetting.
- 02 HT & LT convection zone refractory repaired as per the inspection report.
- 03 Protecting sheet of SS 310 was provided on old ceramic fibre insulation below coil "F" in HT section by M/s.Lloyds with proper provision for thermal expansion.
- 04 Top roof plate of the duct connecting HT & LT section at top was repaired at several places by providing patches of 6 mm thk. C.S.plate.
- 05 Top plate of the flue gas duct connecting primary reformer with HT section was found damaged at several places. It was patched by welding 6.0 mm thick C.S.plate at all such places.

JOB CODE

JOB DESCRIPTION

30

06 Cooling tower side support of LT super heat coil was found damaged which was strengthened by providing additional support plates.

07 3 No. of distributor plates over LT super-heat coils were replaced.

01 12 02 SECONDARY REFORMER 103-D :

01 Secondary reformer air mixer & bottom plugs were removed for replacement of catalyst.

02 Bottom dome was inspected jointly by IFFCO & M/s. MH Detrick (I), Calcutta. Patch work of damaged dome bricks was carried out by Tabcast '94' under the supervision of M/s. M H Detrick.

03 Catalyst & alumina balls were replaced with new one.

04 Air mixer & bottom plug were boxed up after complete final inspection.

01 13 01 COOLERS JOBS :

(A) Following coolers were cleaned by rod poking from inside

01 BFW pumps 104-J/JA lube oil coolers - 2 Nos

02 BFW pump turbines 104-JT/JAT oil coolers - 2 Nos

03 BFW pumps 104-J/JA CW inlet line strainers - 2 Nos

04 ID Fan turbines lube oil coolers - 3 Nos

05 ID Fan turbine cooling water inlet line strainer

06 MEA pump turbine 107-JT LO cooler

07 MEA Pump turbine 107-JT/JAT CW supply line strainers

08 BFW pump 104-J/JA seal coolers - 2 Nos

09 Condensate pump 170-J/JA seal cooler.

01 13 02 COOLER JOBS :

01 105-CA - CO2 STRIPPER GAS EXCHANGER :

105-CA gas side gasket leakage on top side channel cover replaced.

JOB CODE

JOB DESCRIPTION

31

02 114-C - MATHANATOR EFFLUENT FEED WATER HEATER :

North side channel cover gasket was leaking which was replaced. Also all channel cover studs (total 60 Nos) were replaced.

03 115-C METHANATOR EFFLUENT COOLER :

During hydrotest the tube to tube sheet joint leakage was observed. M/s. Anup Engg. was called and total 200 Nos of tubes were expanded. After that the exchanger was hydrotested and found O.K.

04 127-CA/CB REFRIGERANT CONDENSER :

2 No. (1 No each) strainer at C.W. inlet channel cover were provided.

2 No tubes of 127-CA were found leaking these were plugged and exchanger was hydrotested at 31.5 Kg/cm²g.

05 128-C - REFRIGERANT COMPRESSOR INTER COOLER :

Complete exchanger was replaced with new one made by M/s. BHPV.

06 131-JC - AIR COMPRESSOR INTERSTAGE COOLER NO.3 :

131-JC was hydrojetted from tube side. During hydrotest 4 Nos. tubes were found leaking which were plugged and exchanger was again hydrotested at 8.0 Kg/cm²g and found O.K. Hence boxed up.

131-JC outlet separator was removed from its position. It's top cap was cut and internals were inspected. It was again welded. Boot was provided of 6" dia size at drain pipe of separator with 2" dia size drain valve for flushing.

01 14 01 FOLLOWING STEAM LEAK JOBS WERE ATTENDED :

- 01 38 Ata steam to ID Fan turbine steam flow orifice & HP tapping root valve replaced - 1/2" x 1500 # C.S. SW
- 02 BFW coil (Offsite) inlet & outlet isolation valve gland packings replaced.
- 03 PIC-15 U/S drain valve replaced - 3/4" x 800 # SW gate valve
- 04 38K Steam trap (near PIC-20) replaced - 1/2" x 450 #
- 05 Aux. boiler atomising steam header trap below 1st platform relocated.

- 06 FRC-2 main isolation valve's bypass valve gland leak attended.
- 07 Purge gas jacket steam trap (near FRC-2) replaced.
- 08 Steam to air coil (MIC-61) U/S drain valve's gland leak attended.
- 09 101-BJT exhaust valve gland leak attended.
- 10 PIC-14 D/S block valve gland leak attended.
- 11 V-5 D/S drain valve gland leak attended.
- 12 HCV-12 sealing steam drain valve replaced - 3/4" x 1500 # SW gate valve.
- 13 38 ata steam valve to HTS inlet gland leak attended.
- 14 FI-51 A LP tapping root valve replaced - 1/2" x 800 # SW Gate.
- 15 38 ata steam header battery limit trap isolation & bypass drain valves & trap replaced. - 2 Nos 3/4" x 1500 valves & 1 No 1/2" x 450 # trap .
- 16 Position of 38 K Bypass valve at battery limit 38 K changed and valve replaced - 3/4" x 1500 #.
- 17 PCV-81 U/S trap bypass valve replaced - 1/2" x 800 # S.W. gate valve.
- 18 PCV-182 D/S drain valve gland leak attended.
- 19 Aux.boiler atomising steam header trap & its bypass valve replaced - 1/2" x 450 trap & 1/2" x 800 # valve.
- 20 Aux.boiler burner # 2 quick shut off valve U/S joint leak attended.
- 21 Aux.boiler burner # 2 atomisting steam isolation valve gland leak attended.
- 22 V-1 D/S drain valve wheel lock nut provided.
- 23 Reformer steam header trap near PRC-12 changed - 1/2" x 450 #.
- 24 PIV-17 U/S drain valve gland leak attended.
- 25 38 ata steam header boot trap isolation valves replaced - 1" x 1500 # - 2 Nos.
- 26 Isolation valves of TIC-60 replaced - 3/4" x 1500 # - 2 Nos

- 27 Chain valve gland leak above PICV-13A attended.
- 28 11 ata steam valve gland leak near SP-4 attended.
- 29 FRCV-5 U/S block valve's U/S drain valve gland leak attended.
- 30 38 ata steam drain valve above 118-J replaced. - 1" x 800 # SW type gate valve.
- 31 Steam isolation valve to 101-E vent silencer gland leak attended.
- 32 PIC-14 steam trap U/S bypass valve replaced.
- 33 103-JAT casing drain valve flange leak attended.
- 34 103-JLO steam turbine inlet block valve's U/S vent valve replaced - 3/4" x 1500 # S.W. gate valve.
- 35 Seal oil pump steam inlet tray bypass valve replaced.
- 36 38 ata to 102-JT isolation valve gland leak attended.
- 37 38 ata steam pressure switch isolation valve replaced. - 1/2" x 800 # S.W.gate valve.
- 38 38 ata steam to 102-JT vent valve near ESV gland leak attended.
- 39 38 ata steam to 102-JT 1st block valve D/S drain valve gland leak attended.
- 40 102-JLO pumps TIV pilot valve seat lapped to avoid passing.
- 41 Induction steam control valve FIC-202 U/S isolation valve bypass valve gland leak attended.
- 42 Induction steam to 102-JT strainer drain valve replaced - 1" x 800 # S.W. gate.
- 43 102-JLO turbine exhaust RV flange gasket replaced.
- 44 PIC-13A steam equalising valve changed - 3/4" x 1500 #.
- 45 Changed gasket of PIC-13A D/S joint.
- 46 101-CB north side riser joint leak attended.
- 47 Aux.boiler blow down valve's gland leaks attended.
- 48 I.D.Fan exhaust steam valve made easy.

01 15 01 01 103-C PRIMARY SHIFT EFFLUENT WASTE HEAT EXCHANGER :

Inlet channel cover was removed from its position and radiography was carried out on its circumferential weld at repaired position. It was found O.K. The same was boxed up after X-ray.

01 17 01 RELIEF VALVES :

(A) Following relief valves were overhauled/serviced and /or replaced by spare one.

- 01 RV-112-F
- 02 RV-S-7 (11 kg/cm2g)
- 03 RV-107-F1
- 04 RV-101-J air compr.discharge
- 05 RV-104-D1 HTs inlet
- 06 RV-110 F1 (North) flash drum
- 07 RV-110F2 (south) flash drum
- 08 104-F
- 09 RV-11F

(B) Following recommended jobs were done as mentioned against each relief valve below.

Sr.No.	Item No.	Service	Job done
01	RV-101-B	Superheated steam	Drain connection provided with piping.
02	RV 101-J	Air Compr.disch	Support provided on outlet line
03	RV 101-D1	HTS inlet	Inlet/outlet line supports were provided
04	RV-PG-39	PG to fuel	Inlet/outlet line supports adjusted /provided.
05	RV-103-JAT	103-JAT	Support of inlet & outlet line provided.

JOB CODE

JOB DESCRIPTION

35

01 17 02 VALVES - REPAIR / REPLACEMENT :

- 01 108-F level troll bottom drain valve gland leak attended.
- 02 Naphtha fuel line remote plug valve to auxiliary boiler passing attended.
- 03 LTS outlet vent valve V-30 attended for passing.
- 04 LTS inlet vent valve upstream flange leak attended.
- 05 38 ata steam to HTS isolation valve's passing & gland leak attended.
- 06 LR-70 box removed.
- 07 106-F level troll valve LC-13 upstream plug valve gland leak attended.
- 08 108-F level control valve LCV-14 U/S & D/S plug valve gland leak attended.
- 09 FR-33 transmitter LP tapping isolation valve made free.
- 10 101-J/105-JLD cooler bottom old CW line inlet butterfly valve replaced - 4" x 150 #
- 11 130 JC CW return line butterfly valve changed 6" x 150 #.
- 12 115-C gas outlet drain valve changed - 3/4" x 1500 #.
- 13 AG plug valve made operable at battery limit.
- 14 103-C & 104-C drain valve packings changed.
- 15 Changed gaskets of FR-6.

01 19 01 01 CO2 STRIPPERS 102-EA/EB :

Technical deptt. had made a scheme for modification in CO2 stripper trays for tray weeping problem. Following modification was done in different trays.

Trays No. 1 to 5 :

Eight rows of holes on each tray were covered with S.S. 316 / 316L (trays 1,2 & 3 with 316L) (2mm thk). Two rows on either side of liquid inlet to seal pan and two rows on either side of liquid outlet of seal pan were covered. (Total no. of holes covered = 636 No in each tray).

Trays No. 6, 8 & 10 :-

Total four rows of holes were blocked in above three trays by SS 316 (2 mm thk) strips. Last two rows on either side of the liquid outlet to downpour area was blocked. Thus total 284 holes were blocked in each tray.

Tray No. 7 & 9 :-

Total four rows of holes were blocked in above two trays by SS 316 (2 mm thk) strips. Last two rows on either side of liquid outlet to downpour area was blocked. Total 352 holes were covered in each tray.

02 105-F :

105-F manhole was opened inspection was carried out, its demister pad was removed, cleaned and again fixed into position. After internal cleaning and inspection the vessel was boxed up.

03 110-F, 11-F & 112-F :

Manholes of above vessels were opened. The vessels were cleaned through from inside and again the manholes were boxed up. Thickness measurement was carried out before box up.

04 101-F :

Steam drum manholes were opened. Internal cleaning was done. Open inspection and hydrotest at 120 kg/cm² was carried out in presence of boiler inspector.

01 31 00

Following exchangers/coolers were cleaned with hydrojetting

01 101-JCA from tube side.

02 109 C1B / C2B tube bundle removed & cleaned externally. Hydrotested at 47 kg/cm²g after box up.03 116-C cleaned from shell side. Hydrotest done at 15.8 Kg/cm² on shell side.04 115-C cleaned by hydrojetting. While hydrotest leakage observed from tube to tube sheet joint in many tubes. About 200 Nos of tubes were expanded by M/s. Anup Engg. Ahmedabad & hydrotest was completed at 15.8 Kg/cm²g.

05 129-JC from tube side.

JOB CODE

JOB DESCRIPTION

37

- 06 130-JC from tube side.
- 07 131-JC from shell side. Following 4 Nos tubes were found leaking.

<u>Row No.</u>	<u>Tube No.</u>
13	1,5
14	1
15	12

Cooler was hydrotested at 8.0 Kg/cm²g from shell side after plugging.

- 08 105-CA/CB tube side cleaning was done. Shell side hydrotest was carried out at 47 Kg/cm²g.
- 09 111-CA/CB tube side cleaning was done. Shell side hydrotest was carried out at 8 Kg/cm²g.
- 10 103-JLD coolers were cleaned from tube side - 2 Nos
- 11 101-J/105-J L.O.Coolers were cleaned from tube side - 3 Nos.
- 12 101-JT gland condenser was cleaned from tube side
- 13 105-JT gland condenser was cleaned from tube side.
- 14 175-C tube side cleaning done.

AMMONIA PLANT

INSPECTION JOBS

JOB CODE JOB DESCRIPTION

01 41 01 (01) PRIMARY REFORMER 101-B :

(a) Visual inspection of the bottom header insulation, Tunnel slabs, roof insulation, tunnel blocks, wall refractories etc was carried out. The observations made are furnished below:-

01 Minor damage in the bottom header insulation was noticed at the following locations :-

<u>Row No.</u>	<u>Location</u>
3	Below Tube No.41 and 42
4	Between Tube No.5 and 6 weldolet Insulation of tube No.4,7,8 and 26.
5	Between tube No.15 and 16
6	Below tube No.32,33 and 34
7	Below tube No.6
8	Below tube No.42

02 Roof insulation Ceramic fibre blankets, i.e. pyroblocks were found detached from the roof wall at different locations as mentioned below :-

<u>Row No.</u>	<u>Location</u>
1	Near tube No.1,2 and 3 on east side
3	Between row No.2 & 3 Nr.burner No.8
5	Nr. tube No.11,12 and 13
6	Nr. tube No.32,33,34,36 and tube No.6,7

03 Minor damage to the following burner blocks was noticed.

<u>Row No.</u>	<u>Burner Block</u>
1	13
4	06,13 (In these burner blocks only Buffer,block was found damaged)

04 Two nos. of tunnel slabs were found damaged in row No.4

All these findings were informed to concerned shift engineer and Maint.Engineer for necessary corrective actions.

- (b) Automatic Ultrasonic Scanning of Catalyst tubes as well as Riser tubes was carried out by PDIL teams. The following tubes were scanned by PDIL.

<u>Row No.</u>	<u>Tubes No.</u>
5	522 to 542
6	601 to 642
7	701 to 742
8	801 to 842

and all riser tubes i.e. R-1 to R-8. M/s.PDIL submitted their site reports.

- (c) Eddy current testing of catalyst tubes of the following rows was carried out by IFFCO Aonla team.

<u>Row No.</u>	<u>Tube No.</u>
1	101 to 142
2	201 to 242
3	301 to 342
4	401 to 442
5	501 to 521
8	818,819 & 821

M/s.IFFCO Aonla team submitted a report of the same. Ten (10) Nos. of tubes were marked defective in AUS and ECT (as in B & C). After confirming the surety of defects 5 (five) tubes were found to have severe defects and they were replaced (tube No. 108,187,818,819 and 821)

- (d) At random creep measurement of the catalyst tubes was carried out with GO-NO-GO (standard dimension) gauges. The report has been made.
- (e) Bottom header clearance from the furnace floor was measured. The report has been made.

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- (f) Creep measurement of the bottom header at different locations was carried out. A max.creep of 2.4 % was found. The detailed report has been made.
- (g) Upon visual inspection,cracks were observed on Riser weldolets to bottom header weld joints. D.P. test of the all eight riser weldolet joints with Riser and with Bottom Header was carried out. Observed cracks lengths measured for records. The details report has been made .

These cracks were ground off and repaired. Final D.P.test was carried out after repairs.
- (h) In view of having observed cracks on riser weldolets, certain catalyst tubes bottom weldolets insulation was also removed for DP test. Surface cracks were observed on the following catalyst tube weldolet joint with bottom header which were also repaired. Tube No.108,115, and 116. Due to non-availability of bottom header and weldolet insulation in stock, only limited places could be inspected.
- (i) Radiography of 50% of each field butt weld joints of bottom header (i.e 16 Nos of joints) was carried out . No defects was observed. In addition to radiography 100% of these joints were DP tested. No defect was observed.
- (j) Radiogrphy of the tubes which were marked on the basis of findings of Ultrasonic Scanning as well as Eddy Current Scanning was carried out after partial removal of catalyst in order to confirm the presence and severity of the defects.
- (k) D.P.test of the edges and root run as well as after final welding was carried out for the following tubes which were replaced by new ones.

<u>Row No.</u>	<u>Tube Nos</u>
1	108 and 137
8	818,819 and 821

Radiography was also done after final welding. The tube No.137 was replaced by the tube reclaimed and fabricated in our workshop from the tubes removed in Feb,91 shutdown. Remaining four tubes were issued from stores.

- (l) Bottom header drain readings,spring hangers reading of catalyst tubes and transfer line were taken in cold condition. Lot of variations were observed from Kellogg calculated load readings for ctalyst tubes. Cold balancing of catalyst tube spring hangers was decided to be carried out.The spring readings for Catalyst tubes before and after cold balancing, transfer line spring readings are recorded.

Final balancing of the harps shall be carried out in hot condition after plant gets stabilised.

H.T. & L.T. CONVECTION ZONES :

Visual inspection of the wall refractories, coil supports etc. including ultrasonic thickness measurement of the coil bends was carried out. The followings are the observations of visual inspection :-

H.T. ZONE :-

- 01) The top most coil (Steam super-heater coil) supports - 5 Nos. were found to have badly burnt in the area which holds the first row (top row) of tubes. This had also been observed in the past. The condition only of the first support on West side was found better as compared to all other supports of the coil.
- 02) Fins of many tubes in general have got damaged/burnt. The third tube from North side of the top row of tubes of top coil was found to have no fins at few places in approx. 3 1/2" metres length.
- 03) The ceramic fibre blanket holding sheets is in fairly good condition in H.T. - L.T. Zone top compartment.
- 04) Visual inspection of the coils and their supports was carried out from the East wall as the East wall panels were removed during this Shutdown.
- 05) The contract was awarded by Maint.Dept. for removal of badly buckled fibre blanket holding sheets in the bottom compartment of the HT convection zone. New sheets were provided by welding additional holding studs by reducing the pitch distance. Hence visual inspection of the coils and their supports was done from the East wall side. The followings are the observations recorded for the coils.

L.T.CONVECTION ZONE :

(i) STEAM SUPER HEATER COIL :

- (a) The south side bearing plate of the first support from East side was found cracked. This was repaired by putting additional plate support welding.

(ii) B.F.W.COIL :

- (a) The third coil of tubes from top have got shifted downward due to sagging of the coil support. The third coil is now lying on fourth coil of tubes particularly last eight pair of tubes on North side.
- (b) The coil support (No.1 from East side) bearing plate at North end was found cracked and detached.

(iii) BOTTOM COMPARTMENT :

- (i) South side partition wall's North face near New BFW heating coil (Offsites) has got exposed in the area of 12" x 24" due to spalling of the castable refractories, near the manhole. Also 2 Mtrs x 1 Mtrs area of the same wall has got exposed between 1st and 2nd support. The similar exposure has also been observed near west wall.

All the findings of H.T. Zone and L.T. zone were informed to concerned Maint. Engineer and Shift Engineers for necessary action.

Ultrasonic thickness measurement of the coil bends at East side was carried out for both the H.T. and L.T. zone coils. The report has been made.

AUXILLIARY BOILER :

Visual inspection of the auxilliary boiler furnace wall refractories and tubes was carried out. Repairs of the wall refractories including burner block refractories was carried out by Civil section.

Ultrasonic thickness measurement of the furnace tubes was carried out. The report has been made.

01 41 02 SECONDARY REFORMER 103-D :-

Visual inspection of the shell lining and bottom dome brick lining was carried out. The observations are listed below :

(A) SHELL LINING :

Visual inspection of shell refractory lining was carried out after the removal of catalyst. Our observations are :

- 01) Cracks were noticed in almost all places of the refractory lining. Depth of crack was measured with a thin wire (1 MM dia approx) and it was found to be 25 mm to 30 mm in depth.)

- 02) At the top portion of the refractory lining towards North side where two bricks had exposed and its cement lining was found damaged. Similarly towards East side at the top of the lining cement layer have found detached at few places. Patch work was needed to be done in all these locations.
- 03) White colouration was observed at height of 3 ft from the top of the shell lining. The remaining part of the refractory lining was Brownish, black in colouration.
- 04) D.P.test of the top side nozzle liner welding was done. In the bottom circumferential weld seam at 5 places (five) cracks were noticed. The same has to be rectified by grinding and welding.

(B) DOMES BRICK STRUCTURE :

TOP PORTION :

- 01) Top portion of the dome needed thorough cleaning for the removal of dust and alumina balls which were entrapped into the dome brick holes.
- 02) Most of the outer periphery holes of the dome were found choked with catalyst dusts and also a few holes in the remaining inner portion of the dome.
- 03) However, the overall condition of the top portion of the dome was found satisfactory.

BOTTOM PORTION :

- 01) Around 35 to 40 bricks were found damaged due to spalling, out of the portions of bricks upto the depth of 3" to 4" from inside.
- 02) 101 CA and 101 CB inlet nozzle liner was found in good condition.
- 03) Damaged pieces of bricks were lying in the gas inlet path of both 101-CA and 101-CB.

Visual inspection report was prepared and handed over to Maintenance as well as production engineers (A) for necessary action immediately after the inspection was over.

Also a representative from M/s.C.G.CRI (Central Glass and Cermaic Reserach Institute). Naroda Centre, Ahmedabad for their expert opinion regarding condition of the refractories and residual life of the dome structure was invited. The report has been made.

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01 41 03 LOW TEMP SHIFT CONVERTOR - 104-D :

Visual inspection, Ultrasonic thickness measurement and Magnetic particles test of the vessel weld joints were carried out after removal of catalyst. The operations of the visual inspection are listed below :-

- 01) The shell and dished ends had assumed greyish black colouration.
- 02) Wire mesh provided on the steam distributor header was intact and in good condition.
- 03) The steam distributor pipe flange bolts were intact and header supports dit welding was also in good condition.
- 04) The gas inlet distributor at the vessel top was observed to be infairly good condition.
- 05) The vessel internal condition was good. Minor scaling was observed in the top half of the shell, and also on the top dished end. No sign of corrosion, erosion or pitting was observed on the shell and dished ends internal surface.
- 06) In order to carryout magnetic particles test, scaffolding was made inside the vessel for safe approach to the weld joints to be tested. Sandering was carried out in two inch width on either side of the weld joint including weld bead. Flourescent MPT was carried out. No defect was observed. The M.P.test report has been prepared.
- 07) Ultrasonic thickness measurement was carried out. Detailed report has been made.

01 41 04 PRIMARY SHIFT EFFLUENT WASTE HEAT BOILER 103-C :

The east side channel cover, which was repaired earlier, was dismantled from the heat exchanger. Radiography of the complete circumferential repaired weld joint was carried out. No service defects was observed.

01 41 05 STEAM DRUM -101-F :-

Internal inspection and ultrasonic thickness measurement of the steam drum was carried out. Our findings were reported to Maint./Prod.Deptt. for corrective actions. The observations made are listed below:

- 01 Scattered mill scale was observed on both the dished ends and also in the shell.
- 02 Colouration was found to be blackish-grey.

- 03 The bolts in the BFW inlet pipe flange found loosened.
- 04 One bolt alongwith cap nut was found missing on East side 1st cyclonic scrubber counting from North side manhole.
- 05 One clamp had fallen down and was lying on the bottom of shell 3rd down comer opening from North side.
- 06 One bolt with nut was found missing from West side support plate, below the 5th cyclonic scrubber from North side.
- 07 One clamp was found loose on East side plate near 1st cyclonic scrubber from North side.
- 08 One clamp was found loose on East side plate below the 2nd cyclonic scrubber from North side.
- 09 One clamp was found loose on East side plate below 4th and 6th cyclonic scrubber from North side.
- 10 One clamp was found loose and one bolt with nut was missing on the west side plate below 15th cyclonic scrubber from North side.
- 11 One bolt with nut was found missing from West side plate below the 20th cyclonic scrubber from North side.
- 12 One clamp and its nut were found missing from East side plate between 10th & 11th cyclonic scrubber from North side.
- 13 On East side support plate bolt (one No) was found loose in 9th and 10th (from North side) cyclonic scrubber.
- 14 One clamp was found loose on East side plate below the 11th cyclonic scrubber from North end.
- 15 One bolt with nut was found missing from West side plate between 24th & 25th (from North side) cyclonic scrubber.
- 16 One clamp was found loose on West side plate below the 24th cyclonic scrubber.
- 17 Five Nos of bolts on South side and one on North side of support plate were found sheared off on East side.
- 18 Perforated holes provided in the BFW inlet header pipe were found enlarged to a size of approx. 3/4" dia and also pipe wall thickness got slightly thinned near the hole area on the IIIrd pipe from North end. However, the holes on the remaining two distributor pipe were found in good condition.

Concerned shift Engineer/Maint.Engineer was intimated for corrective maintenance of the internals of the vessels.

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01 41 06 CO2 STRIPPER , 102-EA AND 102-EB :

Visual inspection and Ultrasonic thickness measurement was carried out for both the vessels. In general, the following observations were made.

- 01) Condition of the demister pad was good.
- 02) The shell had assumed blackish colouration Throughout the length.
- 03) Thick blackish scaling was observed on the shell surface which was found more towards bottom of the shell.
- 04) Fastening bolts of all the tray segments of each tray were found intact and tight.
- 05) The weld joints of the shell could not be visually inspected due to thick hard and sticky scaling as was observed all around inside the vessels.
- 06) Ultrasonic thickness measurement report has been made.

01 41 07 REFRIGERANT FLASH DRUMS 110-F, 111-F AND 112-F :

Visual inspection of internals and Ultrasonic thickness measurement were carried out on the vessels. The findings are given below :-

- 01) The shells of all the drums had assumed blackish brown colouration.
- 02) Condition of the demsiter pads was good.
- 03) All weld joints were found to be in good condition i.e. free from surface defects. Magnetic particles testing was tried but could not be done due to oily surface of the weld beads/HAZ restricting movement of iron particles.
- 04) Ultrasonic thickness measurement report has been prepared.

01 41 08 SYNTHESIS CONVERTOR INTERCHANGER - 112-C :

Magnetic particles test with permanent magnet was carried out on the outside of dome in order to ascertain the extent of interbead crack observed earlier. The report of MPT is made.

01 41 09 GAUSS MEASUREMENT ON COMPRESSORS AND TURBINES :

GAUSS measurement was performed on compressor and turbine rotors as well as casings etc. The detailed report has been made. However, the brief data is given below :-

01) 101-JT :-

Max.value of gauss measured was 3.5 G on West side of the South side journal bearing & thrust bearing area.

02) 101-JHP CASE :-

Max.value of gauss measured was 3.5 G on bottom half bearing housing on North side i.e. pick up point No.8.

03) 101-JLP CASE :-

Max.value of gauss measured was 1.2 gauss (North bearing) 1.2 gauss on bottom half of North bearing housing.

04) 103-JAT :-

Max.valve of gauss measurement was 12 gauss on bottom housing of North bearing.

05) 105-JHP :-

Max.valve of gauss measured was 3 G on top half of North side bearing.

01 41 10 ULTRASONIC FLAW DETECTION :

In order to evaluate the condition of the weld joints of certain pipe lines listed below, the Ultrasonic flaw detection was carried out on the weld joints. Radiography was also carried out at certain spots which were indicating defect signals to ascertain the severity and nature of them.

LINES TESTED AND NUMBER OF JOINTS :

SR. NO.	LINE DESCRIPTION	NO.OF JOINTS TESTED
01	BF-22-8"	20
02	BF-6-6"	15
03	BF-15-6"	30
04	SG-34-14" ; 123-C TO 121-C	06
05	SG-23-12"	03

SR. NO.	LINE DESCRIPTION	NO.OF JOINTS TESTED
06	SG-22-12"	03
07	SG-21-14"	08
08	SD-29-4"	04
09	PG-6-18"	10
10	PG-7-12"	01

In addition to flaw detection, Ultrasonic thickness measurement was also carried out on those pipe lines. The report of flaw detection and thickness measurement is attached herewith.

01 41 11 THICKNESS MEASUREMENT :

Ultrasonic thickness measurement of the following pipe lines was carried out.

SR. NO.	LINE DESCRIPTION	NO.OF JOINTS TESTED
01	BO-10H-2" Aux.Boiler Blow down line	
02	BO-11H-2" ----- DO -----	
03	BO-12H-2" ----- DO -----	
04	BO-13AH-2" ----- DO -----	
05	BO-14H-2" ----- DO -----	
06	PG-14-16" 102 F TO 106-C	
07	PG-13-18" LTS Outlet to 102-F	
08	PG-26-18" ----- DO -----	
09	PW-1-6" 102-F TO 106-J	
10	PW-17-4" 102-F TO 170-C	
11	PW-4-2 1/2" 102-F TO 106-J	
12	PW-20-6" 104-E TO 170-J	
13	PW-20A-6" 104-E TO 170-JA	

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SR. NO.	LINE DESCRIPTION	NO.OF JOINTS TESTED
14	PW-27-6"	104-E TO 171-C
15	PW-28-4"	PW-27 TO 171-C
16	PW-28A-4"	PW-27 TO 171-C
17	PW-29-10"	171-C TO PW-30
18	PW-29A-10"	171-C TO PW-30
19	PW-31-12"	PW-30 TO 104-E
20	SG-13-12"	124-C TO
21	SG-12-14"	124-C TO 103-J HP CASE
22	MEA-11-14"	102-EA/B TO 109-C
23	SG-35-12"	103-J DISCHARGE TO 121-C
24	SG-11-10"	FIC-7 TO 105-F
25	SG-6-12"	103-J FIRST STAGE SUCTION LINE UPTO FIC-7
26	MEA-26A/B 2 1/2"	MEA-25 TO 102-EA/B
27	MEA-25-3"	LW-5 TO MEA-26
28	VESSEL 102-F	
29	131-JC SEPARATOR	
30	105-ATA TO 30 ATA LET DOWN LINES	
31	106-C TO DEAERATOR :	Aluminium alloy pipe from Deaerator to 106-C were tested Ultrasonically for surveying thickness and the report has been prepared.

The isometric sketches indicating the thickness values and location of points where thickness measurement were done have been prepared.

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CIVIL JOBS

CODE NO.	JOB DESCRIPTION
01 51 01	<u>AUXILIARY BOILER</u>
01	Burner face repair, replacement of burner block for Burner No.1
02	Insulating casting and MK-26 brick fixing on East & West side of Auxiliary boiler.
03	Target wall
04	Header Refractory work
01 51 02	<u>HOT WELL : HT / LT ZONE</u>
01	L.H.V. insulating refractory casting on sides and ceiling including dismantling and cleaning.
02	Making baffle wall.
01 51 03	<u>PRIMARY REFORMER :</u>
01	Dismantling, carting and Re-building tunnel wall besides riser 1 to 8 and near 1.37, 1.09, 8.17, 18 to 21.
02	Fixing of tunnel slab 50 Nos
03	Insulating brick lining on both the manholes including making lintel.
04	Cleaning of all the tunnels
01 51 04	<u>SECONDARY REFORMER:</u>
01	Patch work repair by tab cast - 94
02	Punning the surface by crumicrete
03	Cerafelt cocking near Transfer line
04	Repairing of Arch brick at bottom of dome slab by casting Tabcast -94 and Misc. work near liner.
01 51 05	Water pipe line repairs carried out.

AMMONIA PLANTELECTRICAL JOBS

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<u>CODE NO</u>	<u>JOB DESCRIPTION</u>
01 61 01	Followings jobs were done
01	Preventive maintenance carried out on transformer TR-6 for
	a) Checked and tightened connections at secondary and incoming of MCC switch gears.
	b) Reconditioned /replaced the silicagel in dehydrating breathers.
	c) Tested the insulating oil for BDV values.
	d) Checked trip alarm circuit & cleaned all emergency trip boxes.
02	Oil Filtration carried out for TR-6 to improve BDV values.
03	Carried out preventive maintenance of TMG make LT ACBs installed at MCC-5.
04	Overhauled the following motors :
	a) 101 / 105 EX., 108 J, 111 J, 104 JB, 104 JA,
	b) 104 JTB, 107 JTA, 101BJT, 106 J.
05	Checked all MOVs installed at Ammonia Plant & rectified the defects.
06	Carried out checking of terminal boxes of motor above 50HP for tightness of terminals and measured IR value.
07	Replaced defective TPSOs (flameproof) inside the plant.
08	Provided temporary connections of flood light, hand lamps, hydrojetting pumps and chemical dozing pumps in the plant.

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INSTRUMENTATION JOBS

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CODE NO JOB DESCRIPTION

01 71 01 CONTROL ROOM INST. JOBS :

- 01 Flushed out the main Inst. Air Header and overhauled the main air regulators. The PGR panel header was also flushed out and the regulators are overhauled.
- 02 Multi point recorders for temp, vibration and speed were serviced and calibrated.
- 03 Dis-connected the input signal of 105-J speed from the recorder and connected the output signal of AR-7 for recording the pH. The measuring circuit unit is removed from AR-7 field recorder and fixed in control room recorder for matching input signal. One new signal cable is laid out from AR-7 to control room recorder.
- 04 Overhauled and calibrated the following pneumatic Taylor receiver controllers :

FRC-1, FRC-2, FRC-3, PIC-13 & PRC-18.
- 05 TI-1 - New fuse is provided with the power supply of TI-1
 - a) FIC-15 - The indicating controller is converted into recording type controller as required by Production.
- 06 TRC-10 - Dis-connected the input signal from TRC-10 (Taylor 1400 series) and connected with the second pen of LRA-70 (Taylor 90-J Recorder), as required by Sr. Manager (Prodn).
- 07 Multi point TI(PGR) - Changed rotary selector switch by piano type switches.
- 08 Drum Programmer (PGR) - Removed it and cleared it completely. Flushed out the pneumatic points related with it.

01 71 02 FIELD INSTRUMENT JOBS :

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01 Control valves :

Attended the following control valves for the jobs carried-out with each valve:

a) FRCV-2 :

The actuator yoke (near bonnet) was damaged/cracked in the past so it was welded and tie rods were provided. Removed the defective actuator alongwith complete top work. Fixed new complete actuator on valve. Inspected the seat and plug and removed some scratches from the plug and provided new gland packings and replaced the flange bonnet gasket by new one. Replaced the old 1/4" OD tubes by 3/8" OD tubes and adjusted the stroke. The valve plug rotary movement stopper plate and block are also provided.

b) Gland Packing :

Provided new gland packing for the following control valves:

PICV-181, THICV-137, V-5, PICV-137 Cleaned the valves and checked the strokes.

c) Actuator Diaphragms:

Checked diaphragm of V-5 and found ok. Replaced the old diaphragms of FICV-10, V-3, PRCV-25, TRCV-10, LCV-25 & FICV-202. General cleaning and stroking were carried-out.

d) Control valves on I Reformer top :

Checked and overhauled the valve positioners and air regulators of MICV-1 TO 9 & MICV-24 TO 32. Cleaned the valves and greased the stems and also checked the valve strokes of all the above mentioned valves.

e) Carried out the general cleaning, gland checking, greasing the stem air regulators cleaning, valve positioner pilot cleaning, diaphragms leakage checking, stroke checking etc. for the following control valves:

FRCV-1, MICV-22, PICV-13 A/B, PRCV-25, TRCV-10, FRCV-12 & 14, V-5, FICV-7,8,9,15 & PRCV-4. PICV-10 Hand Jack was overhauled.

f) LCV-16:

Valve was direct operating type by controller output signal, so the action was slow. Provided new valve positioner for quick response. General cleaning was carried-out.

g) PICV-137 :

Opened the valve and removed the internal parts for inspection due to leakage through gland. The plug was found eroded within bonnet and top guide portion. Prepared new plug in workshop. Assembled the valve, cleaned it, provided new gland packing and checked stroke. Fixed the valve on the line.

h) FRCV-3 :

The valve was operating with jerks. Removed it from the line and opened the internal parts and found that gland was hard. Cleaned the plug and overhauled the valve completely. Provided new gland packings, cleaned valve positioner - air set - etc. and fixed it back. Carried-out the stroke checking after connecting all the accessories.

i) FRCV-23 :

Carried-out the cleaning and general checking of damper cylinder and other components. Checked the stroke and found it ok.

j) LCV-13 :

Opened the valve for checking of seat and plug and found the plug eroded. Changed the set of plug and seat by new set. Provided new gland packings and checked the stroke.

k) LCV-25:

It was reported as not operating properly. Checked and found the plug bent. Removed it and prepared new plug in w/s. Assembled the valve, changed the actuator diaphragm and gland packings. Adjusted the stroke. Fixed the valve back on the line.

l) PRCV-18:

It was opened from bonnet with plug for checking the mud. The valve body was quite empty. Assembled the valve and checked the valve stroke after general cleaning, greasing etc.

m) PCV-181:

It was reported for passing at full close position. Removed the bonnet with plug and lapped seat and plug to remove the small scratches. Assembled and adjusted the plug for full close position and checked the stroke.

n) VS-103:

(Naphtha valve) was operated for full close to full open by operating the solenoid valves electrically from panel and found ok. Cleaned the valve.

o) PCV-33:

It was reported for not controlling the pressure. Opened and found the mud from the line, cleaned it properly and assembled.

p) MICV-11 :

It was reported passing the condensate at full close. Removed the bonnet with plug. Lapped the seat and the plug (double port) and assembled it. Adjusted the stroke. The valve positioner is also overhauled.

q) Governor positioners of 101J & 105J were overhauled and calibrated.

r) LCV-8 :

The valve was passing. Opened and found the seat and plug damaged due to hard foreign material. Changed the seat and the plug.

10 FIC-17 TX, FI-49 TX, FR-35 TX & FR-33 TX :

Replaced the old defective three valve manifold by new ones. FR-33 LP tapping line fitting is rectified for stopping the steam leakage.

11 General checking and cleaning of F-N & Orifice of the following transmitters were carried-out.

FRC-1,2,3, PIC-13, PIA-82, PRC-18, FIC-7,8,9,10,11,15.

12 Air Regulators :

Changed the air regulators of following Insts:

Transmitters: FRC-2, FRC-5, FI-51A, PRC-18 & PRC-25.

Control valves: PICV-16, PRCV-18, TRCV-10, MICV-25, 26 & 30.

- 13 Calibrated the following field transmitters and indicators :
- FI-58, FI-51A (0 TO 20000 MM H₂O), PDIA-52 & 20 A.G. to OFF level (TX) (0 to 30 inch H₂O).
- 14 LC-23 :
- It was not working properly overhauled and calibrated the level controller as it was slightly out. Cleaned and lubricated the valve and adjusted for proper stroke. Made the valve free for smooth operation.
- 15 MIC-22 :
- Oil leakage was observed in the impulse line fitting near controller and rectified it.
- 16 Removal and refixing of instruments like vibration probes, T/Cs, gauges, field switches etc. were carried out to facilitate for mechanical services jobs on main equipments like compressors, BFW pump (10h-JAT) 114-C, 115-C, Reformers etc. Also switched off the powers of ANNUNCIATORS, GAS CHROMATOGRAPH, PGR, PANEL, NG PANEL ETC. during the shut-down and switched ON at start-up.
- 17 U.P.S. SYSTEM :
- The general cleaning, checking and servicing of chargers and inverters were carried out by the service engineer of M/s. Vistar Electronics Ltd. The charging, discharging and again charging of batteries was also done by him.
- 18 Main air header of PIC-13 TX, PICV-17/20 was supported at upper level by welded support.
- 19 The local controllers (440R model) of LC-18 & 19 are removed as per the instruction of Sr. Manager (Prodn), as they are no more required.
- 20 REFORMERS AREA :
- a) Removed and refixed the skin temp T/Cs of IInd Reformer top flange.
- b) Removed the thermo wells with thermocouples of TI-1-118/119/120 and TI-1-118 (spares). Provided new set of T/Ws with T/Cs for TI-1-118- 119 & 120. The tapping point of TI-1-118 (spare) is blocked by old (short length) T/W and refractory, because insertion of new

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T/W was not possible due to metallic obstruction in tapping point (pocket.).

- c) Pt. No.5 of 103-D metal tempr: Provided new T/C element.
- d) G.C. sample point near 103-D: Laid out new SS tubes for cooling the sample by DM water from ground level (TCV-131 drain point).
- e) 102-C bottom T/W (TI-1-47) was removed for checking the water due to possible leakage and found no leakage and refixed it. The T/W condition is good.
- f) Tunnel Temp. Points :

Removed the defective thermowells and provided new T/Ws with T/C elements for the following temp. points:

<u>Point No.</u>	<u>TI No.</u>	<u>Point No.</u>	<u>TI No.</u>
1	1-68	7	1-74
2	1-69	8	1-75
3	1-70	9	1-76
6	1-73		

- g) Reformer draft sample lines:

New 1/4" SS tubes are laid from draft tappings and extended them upto outside of convection zone. Provided new supporting trays for above tubes alongwith platform.

- h) Welding work:

Welded the mounting stands for PDI-53, PDI-55, new electronic type pressure transmitters and necessary cable trays. Provided the platform for FRC-1 orifice flange and T/C on convection bank.

- i) LA-1061 (II-Reformer):

Jacket level switch connecting wires were found broken and level switch head was also found bent. Rectified them and also overhauled the level switch completely. New cable alongwith small J/B and conduit pipes are provided.

j) J/B-3 :

Replaced all the old terminal strips as most of them were corroded.

21 Auxilliary Boiler:

Provided new pilot burners for lighting up the fuel gas of main burner Nos.1 & 2.

22 Provided tubings from LTS inlet and outlet to laboratory for collecting the samples during new catalyst reduction. Dis-connected the same after the completion of LTS catalyst reduction.

23 The LTS Rotameters are completely overhauled before the LTS catalyst reduction.

24. Stream Drum :

a) LIC-1: Leveltrol is cleaned. Flushed out the air regulator and calibrated the leveltrol.

b) EYE-HYE : Leakage was observed in the chamber. Replaced the defective electrode of +1 lamp.

c) High & Low level alarm checking was carried-out. The connecting wire of low level switch was burnt. Provided new silicon wire alongwith new small junction box.

d) The local boiler 'PI' was calibrated for boiler inspection.

25 COMPRESSORS :i) 101-J :

a) Removed trip sol. valve for checking the ports, as oil flow was not coming. Actually the pipe was chocked. Overhauled the sol. valve.

b) New T/W with temp. gauge was provided on 38 ata steam line.

c) All the removed probes were fixed and set after the completion of Mech. services.

d) Changed the probes of 6V and 4V on gear box.

ii) 105-J :

a) New T/W with temp. gauge was provided on 38 ata steam line.

- b) Dis-connected the TACK PACK Speed unit as new Beacon Speed System was found alright.
- c) Seal oil pressure gauges are calibrated.
- d) Provided new tappings and connected tubes alongwith pressure gauges on balance lines (2 Nos).
- e) Checked and calibrated the oil pressure switches at the time of start-up.
- f) Changed the following doubtful probes from HP case:
EA-EB, 4V-4H, 3V-3H.

iii) 103-J :

- a) LAH-138: The signal cable from level switch to AU-D was defective. Provided new armoured cable.
- b) AU-D hooter was not working due to old defective wiring/terminals etc. Rectified it.
- c) LP and HP case seal oil overhead tank level :
Calibrated the leveltrols of both the tanks by rising and falling the actual oil level. Adjusted the leveltrols and set the high alarm, low alarm, A.O.P. start and trip switches according to required level values in presence of Production personnels.
- d) 103-JT Axial probe NO.B (2 Nos) are replaced by new probes as they were doubtful.
- e) Compressor axial Pt.No.9 (North bearing) - Both the probes were damaged at the time of compressor tripping when non-return valve failed. Provided new probes.
- f) FIC-8: Removed pitot tube assembly for inspection and found ok. Cleaned and fixed back.
- g) FR-40 : One local flow indicator is provided near FIC-78. Changed the probe of 4V by new one.

iv) 102-J (N.G. Compressor):

- a) LIC-212 output was matched with control valve opening by calibrating controller and valve positioner.
- b) The steam exhaust PI is calibrated.

c) The trip alarm window light was not coming due to loose connection of bulb holder. Shifted the alarm in spare window.

d) PIC-300 Controller is overhauled and also overhauled LDW selector of anti-surge. Replaced the flexible tubing bunch of PIC-300, as it was punctured.

26. TI-1-37 (Flash Drum - 112F) :

The T/C element was defective. Replaced it with new one.

27. PGR :

a) Local panel of compressor : Isolated the panel from different connections. Removed the panel and kept in Inst. shop.

b) RTD J.B: Cleaned and replaced all the terminal strips.

Pneumatic J B: Overhauled and changed the location.

Press switch J B: Changed the location and cleaned J B.

c) LA-105 : Leveltrol is calibrated and checked alarm setting.

d) Welded one vertical cable tray for supporting the NG to AG let down transmitter cables.

28. INSTRUMENT AIR SYSTEM :

a) Flushed out all main air headers in field and panel air headers like - cont. room air headers, PGR & NG panel air headers.

b) Cleaned and flushed out all the air regulators related with the attended instruments like - transmitters, controller and cont. valves during shut-down.

c) Old air Dryer : Cleaned, lubricated and pointed it.

29. MISCELLANEOUS JOBS :

General cleaning, covering, supporting, painting of field boxes, transmitters, control valves, switches, racks etc. were carried-out.

30. Flushing of impulse lines of oil system, steam, condensate and process was carried out during start-up.

PLANT TURNAROUND - NOVEMBER 1992

61

AMMONIA PLANTTECHNICAL DEPARTMENT JOBS

CODE NO	JOB DESCRIPTION
01 81 01	Following jobs were carried out.
01	Extension of the Primary Reformer ID Fan stack by 8 metres i.e. from 32 mtr to 40 mtrs.
02	Installation of oil separator and piping for the A.G. Supply to the Offsites.
03	Hook up of 2 Nos seal pots for the vent pipes.
04	Installation of strainers in Exchangers of 127-CA/CB
05	Taking of 02 Nos critical tappings in the Ammonia plant for the L.T.S. catalyst reduction system.
06	Diversion of 156-F water to the DM Water heater in the offsites.
07	07 Nos Tappings for the Refrigeration system draining facilities.
08	Installation of 2 Nos Motor operated valves actuator in Ammonia.

CODE NO	JOB DESCRIPTION
01 15 00	<u>101-CA - PRIMARY WASTE HEAT EXCHANGER :</u> After major shutdown jobs were over and start up activities were in progress on 16th Nov. suddenly steam drum level dropped. It was suspected that 101-CA was leaking. Immediately plant shutdown was taken. M/s.CEDCO was awarded the contract for replacement of 101-CA tube bundle.Total group was divided into two - One for making spare tube bundle ready and another for removing existing tube bundle. Spare tube bundle (one which was removed from 101-CB in July 1992) was separated into inner & outer tube bundle assemblies.2 Nos. of its tubes were plugged in both inner and outer tube bundle assemblies. After plugging these 2 Nos of tubes both the bundle assemblies were boxed up & hydrotest at 125 Kg/cm2g was carried out while on the rack. The existing tube bundle was removed from its position with 30 Ton chain block and HM crane and repaired tube bundle was installed in its position. Boiler inspection was carried out at 120 Kg/cm2g in presence of CIB and front end of plant was restarted on 24th Nov,92. On start up gas side flange of exchanger leaked which was furmanited.

CODE NOJOB DESCRIPTION

01 01 00

Nozzle Valve Spindle Failure: (05-12-92 TO 06-12-92)

103-J Compressor was taken in operation on 3-12-92. On 5-12-92 the compressor was found to be coming down in speed. The Production staff on duty assuming that the compressor has stripped took a total Back End shutdown. Compressor was restarted to confirm the defect wherein it was noticed that compressor is not going beyond 5000 RPM which established that the problem lay in the drive turbine and not in the compressor.

Steam chest valve assembly was taken on for inspection of nozzle valve wherein the nozzle valve operating spindle was found broken. We did not have extra valve spindle as spare. Hence, two of the old removed valve spindles taken and their run out, hardness etc. were checked. It was found OK. Hence, the same were re-used. All bolts of gland housing were welded. While assembling the nozzle operating gear, the following was done:

Nozzle bar for end spindle was found jam in it after bolt tightening. To make it free, machining was carried-out on nozzle bar to make a step for washer of spindle lock out so that on washer OD, proper clearance is maintained to take care of the nozzle bar expansion.

- (2) HP case suction line strainer was checked and found that it was clear and no blockage was observed.
- (3) Check valve on HP case suction line was dismantled and found that its flapper was detached from its lever as the lever was found broken. The lever was repaired by welding and the check valve was boxed up.

Looking to above observations it was concluded that compressor had surged due to less suction flow to HP case.

Further total rotor float was measured without end seals and found to be 0.312" as against 0.295" noted at the time of last overhaul in 1986 in presence of Dresser Clark representative. The new end seals and floating seals were assembled and again rotor float was measured and was found to be 0.312".

Hence it was decided not to open the barrel and box up the machine with new bearings.

The machine was boxed up after replacing new thrust collar and new thrust bearings. The old journal bearings were reassembled as the same were found in good condition.

After assembling new thrust bearing, rotor position was measured as follows.

- Total rotor float without thrust bearing - 0.312" (7.8 MM)
- Rotor float towards suction side - (3.4 MM)
- Rotor float towards discharge side - 4.4 MM
- Total Axial float with thrust bearing in position. - 0.016"

The machine was put on slow roll on 3-12-92 at 11.45 hr at 1000 rpm for 1 hour. Then speed was further increased to 9400 rpm and run for 4 hour. All parameters were checked and field vibration measurement were noted and found within the permissible limit. The Bently panel vibrations were also found within permissible limits.

The compressor was taken on load at 22.15 on 3/12/92. The loading was done gradually. All other vibration parameters were within limit except axial displacement of Rotor which was observed as 19.5 mils at 83% load. The compressor was running smoothly at 83% load till 01.30 hours on 5/12/92. The balance drum pressure was remaining 68.5 to 69 Kg/cm² against suction pressure of 63.5 and 64 kg/cm²g for HP case.

The machine was reported to be stopped at 01.30 Hr on 5/12/92 as it's speed was coming down due to failure of spindle of nozzle valve bar of HP turbine 103-JAT. Before the machine was tripped following was observed on Bently Nevada panel.

- LP compressor North Bearing Alert Alarm
- HP compressor both south and north journal Brg. - Alert & Danger Alarm
- Axial displacement of HP case - 18.5 Mills on recorder
- Thrust bearing temp. of HP case - 76 degree C.
- All other process parameters - within limit
- Suction pressure - 64.5 Kg/cm2g (normal value 65Kg/cm2g)
- Balance drum pressure - 69 Kg/cm2g against normal value of 66 kg/cm2g.

The compressor was restarted at 05.30 on 5/12/92 and increased the speed to 5000 rpm without load. The vibration and all other parameters were normal but the speed was not increasing beyond 5000 rpm due to less steam flow through the turbine. The compressor was stopped for further investigations.

After attending 103-JAT nozzle operating spindles failure, Compressor was started on 7-12-92.

01 01 00

103-J OVERHAULING: (12-12-1992 TO 26-12-1992)

1. Synthesis Gas Compressor was restarted after attending the job of control valve spindle replacement on 7th December, 1992. In the Bently Nevada panel, the axial displacement of HP rotor was showing 17-18 mills in normal side. 0.017" axial float with thrust bearing was maintained after attending thrust bearing job. But however, displacement shown in Bently Nevada panel was more than the anticipated displacement. Oil outlet temperature of thrust bearing was 76-77 degree C.
2. The plant load was restricted due to some other limitation till 12th December, 1992. When plant load was gradually increased on 12.12.92 to 81% at 10.35 am, suddenly the synthesis gas compressor was tripped due to high axial displacement of HP stage. The axial float was checked and found increased from 0.017" to 0.029".

H.P. CASE :

Internal bundle assembly was dismantled. The rotor run out was checked and found the maximum run out of rotor as 0.07 mm. The rotor balance drum diameter found 9.750" (as per design also, it should be 9.750"). However, in 30% circumference on outer surface of the balance drum, metal deposited during manufacturing had peeled off and machine threads could be seen. The clearance of balance drum in Honey Comb seal was found 0.018" as kept during previous overhauling in 1986.

Impeller eye and rotor shaft had rubbing marks of labyrinths.

First impeller eye face found rough indicating minor wear due to suspected contact with first diaphragm.

Gap of 1.00 mm found between impeller No.6 and spacer. However, the impeller lock nuts on thrust end was found intact without any looseness.

Impeller faces found smooth.

Diametrical thickness of worn-out small and large interstage labyrinths measured and compared with new ones. Average wear of 0.6 mm to 0.88 mm found for small labyrinths and 0.9 mm to 1.00 mm for large labyrinths. No axial visible damage seen on labyrinths faces.

New end seals provided in HP case during recent thrust bearing failure was found OK. Labyrinths found worn-out.

Diaphragm face at vanes near labyrinths had minor cracks.

Journal bearing found OK.

Bearing journals and seal diameter of rotor found smooth without any scoring mark.

ASSEMBLY OF HP CASE :

New rotor run out was checked and found maximum 0.01 mm at one or two places. Run out reading of new and old rotors enclosed.

Since the old diaphragm had some minor cracks on its faces, it was decided to replace all diaphragms by new one. However, 8th stage new suction diaphragm was not perfectly matching with 8th impeller eye. Labyrinths of 8th suction was not covering the impeller eye. Hence, it was decided to use the old diaphragm for 8th stage suction.

Labyrinths clearances are maintained as per manufacturer's recommendations and is enclosed with the report.

Rotor float inside the diaphragm assembly found 7.53 mm.

Rotor with diaphragms and inner bundle assembly was inserted inside the barrel with new O'rings and gaskets. This new rotor is designed with thrust collar which is to be installed with hydraulic system.

Total end seal assembly length was compared with cavity and found OK.

End seal inner labyrinths, inner seal ring, middle seal ring and outer seal rings were replaced with new O'rings. All matting faces were lapped.

Old journal bearings were used. Bearing clearances are shown in enclosed sheets.

After thrust collar assembly, the total float was checked and found 7.25 mm.

Float without active side thrust pads was maintained at 3.55 mm (Gap between impeller suction face and diaphragm).

Float with complete thrust bearing = 0.4 mm.

Suitable modification in end cover was carried out to accommodate axial probes with new rotor.

L.P. CASE :

Reading before dismantling:

- | | |
|--|-----------|
| a) Axial float with thrust bearing | = 0.45 mm |
| b) Axial float without active side thrust pads | = 2.10 mm |
| c) Axial float without thrust bearing | = 5.85 mm |
| d) Journal bearing clearance dis.side | = 0.13 mm |
| e) Journal bearing clearance suction side | = 0.11 mm |

Internal assembly was taken out from the barrel.

The old rotor run out was checked and the readings are enclosed. Maximum run out was 0.09 mm.

Since the rotor run out was more, it was decided to replace this rotor by new one.

New rotor with old diaphragm and new labyrinths were assembled and inserted inside the barrel.

END SEALS :

Inner labyrinths, inner seal ring, middle seal ring and outer seal rings were replaced by new one.

Old journal bearings and old thrust bearings were re-installed.

Bearing clearance, seal clearance, labyrinths clearances are mentioned in the enclosed chart with run out readings of old and new rotors.

Axial float with thrust bearing = 0.40 mm

Axial float without active side = 3.05 mm

Axial float without thrust bearing = 6.25 mm

Both the new rotors are provided with thrust collar which is to be installed with hydraulic system. While fitting the thrust collar, following maximum pressure of pusher and expander pump were required:

Pusher pump pressure = 5000 psi

Expander pump pressure = 20000 psi

Thrust collar face run out after installation = 0.01 mm.

H.P. CASE SOUR OIL TRAPS :

- Both HP case sour oil traps were removed from their position, cleaned and again replaced into their position.
- All sour oil lines were removed, cleaned thoroughly and again refixed.
- All orifices in retrieve gas line (total 03 Nos.) were checked and again properly mounted into their respective position.
- No choking etc. was found in orifices, sour oil lines or sour oil traps.
- Degasser tank of 103J was opened & cleaned thoroughly.

No seal oil leak reported after running the compressor.

IRD instrument and Bently Nevada panel readings after loading the compressor is enclosed.

Compressor train was put on slow roll at 03.00 am on 26.12.92.

CODE NO

JOB DESCRIPTION

70

Compressor was speeded upto 8800 RPM at 07.00 am on 26.12.92.

Compressor was loaded at 07.00 pm on 26.12.92.

All vibration/displacement readings noticed in Bently Nevada panel and external vibrations through IRD found normal.

Alignment readings of this train is enclosed

RECOMMENDED CLEARANCES

REF.	CLEARANCE	BETWEEN
A	0.002" TO 0.004"	OIL GUARD (50)
B	0.013" TO 0.016"	BEARING HSG (5)
C	0.004" TO 0.007"	BEARING PAD (40)
D	0.015" TO 0.022"	OIL GUARD (6)
E	0.008" TO 0.011"	RING (7) (8)
G	0.008" TO 0.011"	RING (5)
K	0.040" TO 0.044"	RING (42, 46, 50)
M	0.040" TO 0.044"	BUSH (45)

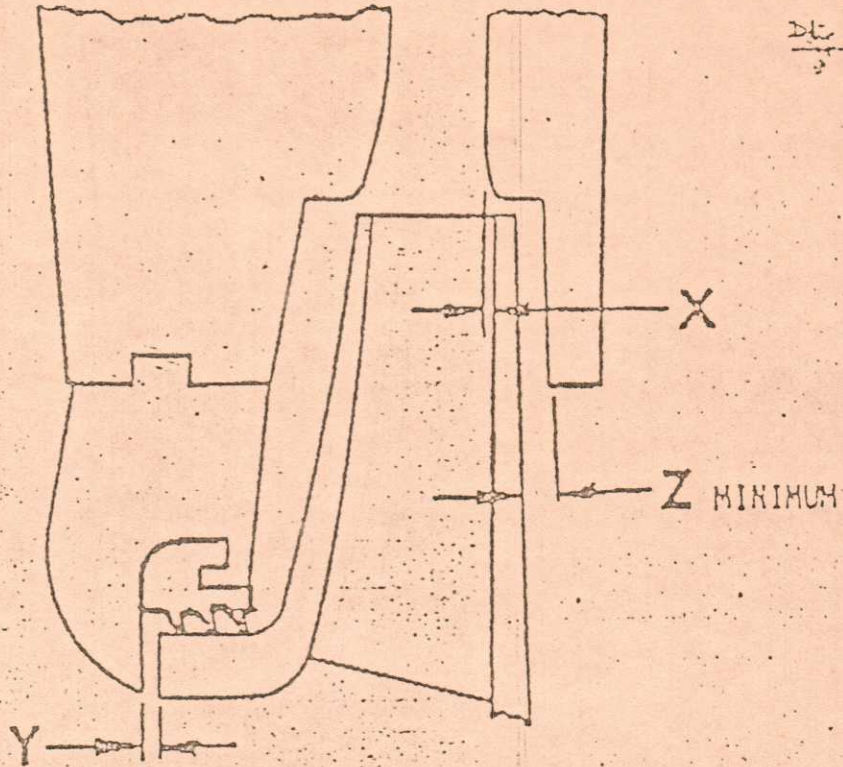
Total Float of rotor 71
= 2.55mm

AFTER	BEFORE		BEFORE	AFTER
<u>0.002"</u>	<u>0.002"</u>	OIL GUARD (60)-A	<u>0.002"</u>	<u>0.003"</u>
		TOTAL FLOAT WITHOUT SHOES $\frac{1}{8} \times 2 \frac{1}{2}$	<u>0.008"</u>	<u>0.008"</u>
	<u>0.002"</u>	OIL GUARD (60)-A	<u>0.002"</u>	
		JOURNAL BRG C AND B CLEARANCE 0.004" TO 0.007"	<u>0.005"</u>	<u>0.006"</u>
<u>0.003"</u>		OIL GUARD (6)-D		<u>0.003"</u>
		RING (7)-E		
<u>0.002"</u>	<u>0.002"</u>	BALANCE DRUM RING (9)-G	<u>0.002"</u>	<u>0.002"</u>
		WHEEL (67)		
<u>0.013"</u>	<u>0.013"</u>	CASE RING (50)-K	<u>0.013"</u>	<u>0.013"</u>
<u>0.012"</u>	<u>0.012"</u>	DIA. BUSH (43)-M	<u>0.011"</u>	<u>0.013"</u>
		WHEEL (67)		
<u>0.013"</u>	<u>0.012"</u>	CASE RING (50)-K	<u>0.012"</u>	<u>0.013"</u>
<u>0.012"</u>	<u>0.012"</u>	DIA. BUSH (44)-M	<u>0.010"</u>	<u>0.012"</u>
		WHEEL (11)		
<u>0.012"</u>	<u>0.010"</u>	CASE RING (50)-K	<u>0.010"</u>	<u>0.009"</u>
<u>0.013"</u>	<u>0.010"</u>	DIA. BUSH (45)-M	<u>0.010"</u>	<u>0.012"</u>
		WHEEL (21)		
<u>0.012"</u>	<u>0.011"</u>	CASE RING (50)-K	<u>0.011"</u>	<u>0.013"</u>
<u>0.010"</u>	<u>0.009"</u>	DIA. BUSH (45)-M	<u>0.009"</u>	<u>0.010"</u>
		WHEEL (25)		
<u>0.012"</u>	<u>0.012"</u>	CASE RING (46)-K	<u>0.010"</u>	<u>0.013"</u>
<u>0.012"</u>	<u>0.014"</u>	DIA. BUSH (45)-M	<u>0.014"</u>	<u>0.016"</u>
		WHEEL (25)		
<u>0.015"</u>	<u>0.011"</u>	CASE RING (45)-K	<u>0.014"</u>	<u>0.016"</u>
<u>0.013"</u>	<u>0.012"</u>	DIA. BUSH (45)-M	<u>0.012"</u>	<u>0.013"</u>
		WHEEL (30)		
<u>0.012"</u>	<u>0.012"</u>	CASE RING (45)-K	<u>0.014"</u>	<u>0.015"</u>
<u>0.002"</u>	<u>0.002"</u>	RING (8)-E	<u>0.002"</u>	<u>0.003"</u>
<u>0.002"</u>	<u>0.002"</u>	OIL GUARD (6)-D	<u>0.002"</u>	<u>0.004"</u>
		JOURNAL BRG C AND B CLEARANCE 0.004" TO 0.007"	<u>0.005"</u>	<u>0.006"</u>
	<u>0.003"</u>	OIL GUARD (6)-O	<u>0.002"</u>	
		COUPLING		

DRAWING NO.		SCALE	
010207068110		H.P. CASE	
RUNNING CLEARANCES OF BEARING LABYRINTH BEFORE AND AFTER OVERHAULING OF 101-J			
INDIAN FARMERS FERTILISER CO. LTD., PATNA			
REV.	DATE	BY	CHKD.
1			

LP case bundle with New Rotor. 74

DL 19-12-92



MINIMUM Readings taken after pushing the rotor 0.120" towards discharge.

Unit	2BC9			2BF9-8								
Dim.	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
Stage 1	.062	.100	.100	.062	.100	.100	(mm)	(Inch)	(mm)			
Stage 2	.062	.100	.100	.062	.100	.100	3.44	0.120"	6.40			
Stage 3	.062	.100	.100	.062	.100	.100	3.54	0.125"	6.20			
Stage 4	.062	.100	.100	.062	.100	.100	3.64	0.105"	6.24			
Stage 5	.062	.100	.100	.062	.100	.100	3.60	0.140"	6.30			
Stage 6	.062	.100	.100	.062	.100	.100	3.70	0.160"	6.20			
Stage 7	.062	.100	.100	.062	.100	.100	3.60	0.132"	6.30			
Stage 8	.062	.100	.100	SS	SS	SS	3.92	0.149"	6.20			
Stage 9	.062	.100	.100	.062	.100	.100		0.143"				
Stage 10												

SS: Sidestream Inlet Location

IMPELLER - DIFFUSER PASSAGE OVERLAPS & AXIAL CLEARANCES

DRESSER-HAND

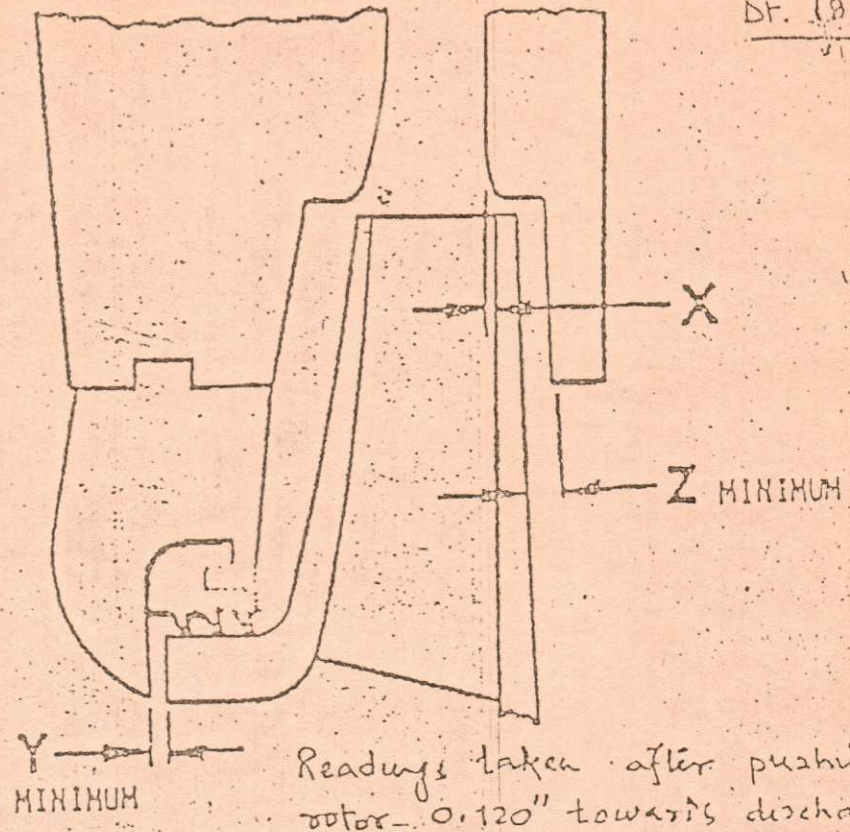
NOV 1992

103 JHP

75 / 15

HP Case Bundle with NEW rotor, NEW Guide

DT. 18/12/92

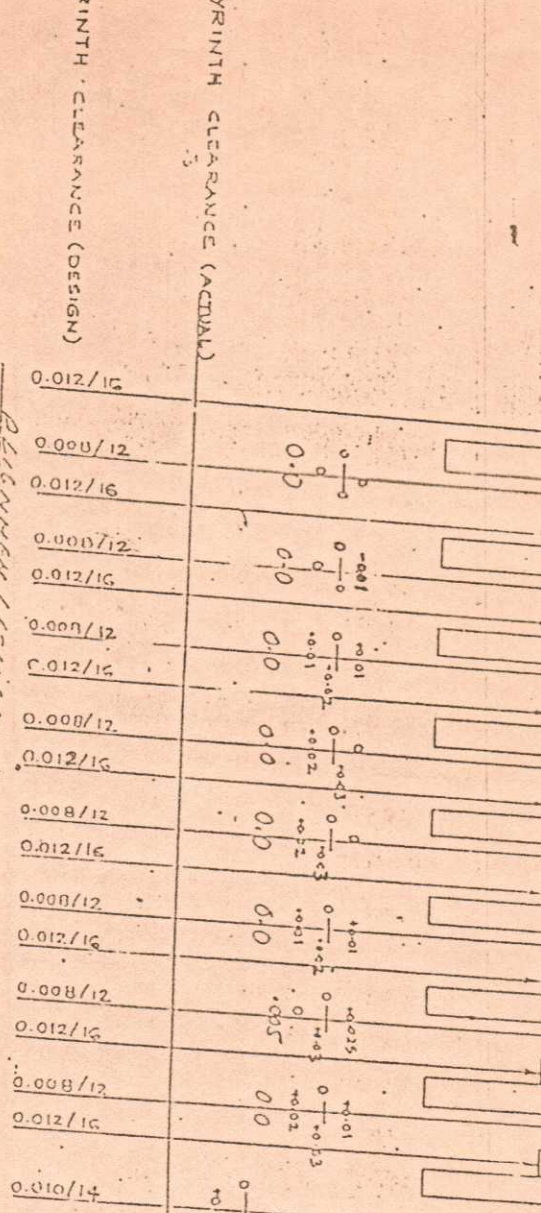
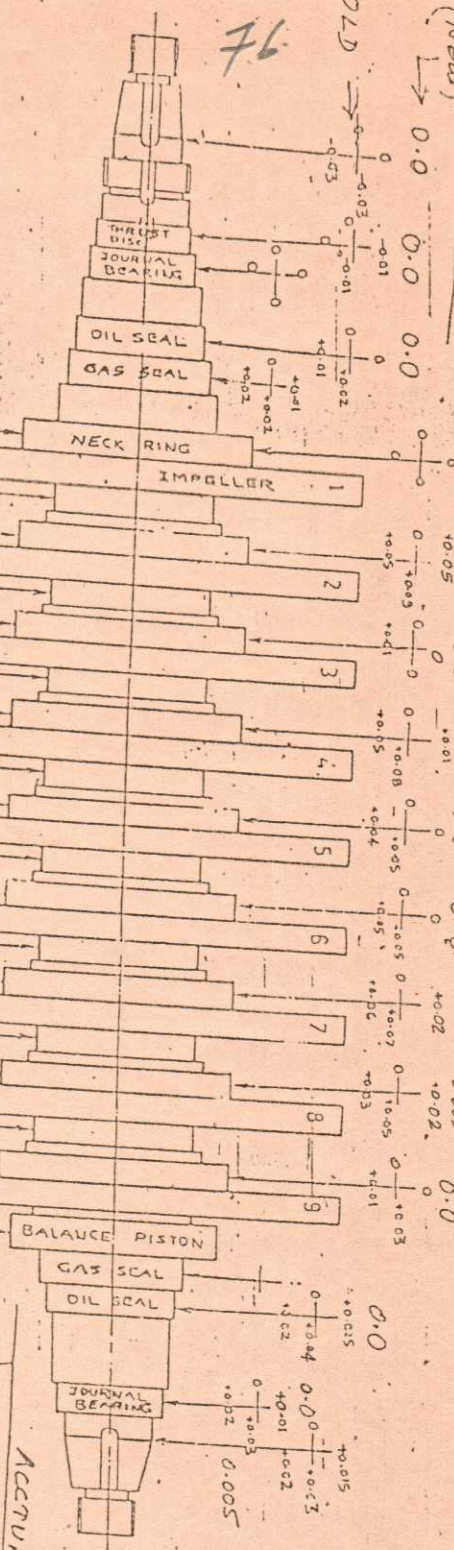


Readings taken after pushing the rotor 0.120" towards discharge end

Unit	2BC9			2BF9-8							
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y
Stage 1	.062	.100	.100	.062	.100	.100	2.8				
Stage 2	.062	.100	.100	.062	.100	.100	3.6	3.00	7.22		
Stage 3	.062	.100	.100	.062	.100	.100	3.22	3.00	6.58		
Stage 4	.062	.100	.100	.062	.100	.100	3.34	3.22	6.58		
Stage 5	.062	.100	.100	.062	.100	.100	3.54	3.50	6.36		
Stage 6	.062	.100	.100	.062	.100	.100	3.60	3.52	5.98		
Stage 7	.062	.100	.100	.062	.100	.100	2.56	3.28	5.98		
Stage 8	.062	.100	.100	SS	SS	SS		3.70	5.50		
Stage 9	.062	.100	.100	.062	.100	.100					
Stage 10											

SS: Sidestream Inlet Location

IMPELLER - DIFFUSER PASSAGE OVERLAPS & AXIAL CLEARANCES



ACTUAL CLEARANCES

JOURNAL BEARING CL.	0.005"
THRUST BEG. (TOTAL NINE)	0.016"
SEAL RING (JOURNAL BEG)	0.019"
SEAL RING (THRUST BEG)	0.007"
LADYRINTH SEALS - SMALL STAGES 1 TO 9	0.006"
BALANCE PISTON LADY.	0.012"
INNER LADYRINTH	0.007"
INNER SEAL RING	0.002"
OUTER SEAL RING	0.0065"
TOTAL AXIAL FLOAT	0.246"
SUCTION SIDE FLOAT	0.119"
DISCHARGE SIDE FLOAT	0.127"

DESIGN Labyrinth TURBINE TO LA COMP. - 0.015
 ACTUAL Labyrinth TURBINE TO LA COMP. - 0.015
 THRUST COLLECTOR FACE RUNOUT - 0.01 M.M.

103 JLP to 103 JAT coupling flange 6.83 mm
 coupling gap = 17.523"

INDIAN FARMERS FERTILISER CO. OP. LTD. KALDI

NAME	DATE	PLANT	EWB No.
KAM	19.12.92		

RUNNING CLEARANCES OF
 103 J LP CASE ROTOR (COLD)
 DATE: 19.12.92 (SUPP-OUT)

DRAWING NO. 71.01-206
 PART NO. SN-71.01-206
 MODEL - 23C.9
 SER. NO.
 NOV 1992
 MUMBAI PLANT SD REPORT - 5

NOV-DEC '1952 78

RECOMMENDED CLEARANCES

REF.	CLEARANCE	BETWEEN
A	0.020" TO 0.026"	SHAFT (45) & GUARD (73)
C	0.002" TO 0.004"	SHAFT (45) & GUARD (10)
E	0.014" TO 0.017"	SHAFT (45) & HOUSING
F	0.006" TO 0.008"	SHAFT (45) & JOUR. BRG.
G	0.005" TO 0.007"	SHAFT (45) & BUSHING
H	0.018" TO 0.022"	SHAFT (45) & RING (17)
K	0.018" TO 0.022"	RING (19) & RING (20)
N	0.030" TO 0.035"	WHEEL & RING
R	0.025" TO 0.029"	WHEEL & BUSH
T	0.020" TO 0.026"	SHAFT & GUARD (44)

NEW ARM SD REPORT NOV 1952

AFTER	BEFORE	COUPLING G.B. END	BEFORE	AFTER
_____	_____	GUARD (73)-A	_____	_____
_____	_____	THRUST BEARING	TOTAL END PLAY 0.011 TO 0.015"	0.014"
_____	_____	GUARD (10)-C	_____	_____
_____	_____	JOURNAL BEARING	F	0.007"
_____	0.010"	BUSHING G	0.006"	_____
_____	0.010"	RING (17)-H	0.006"	_____
_____	0.021"	BALANCE DRUM RING (20)-K	0.010"	_____
_____	0.017"	IV WHEEL (22)	_____	_____
_____	0.009"	RING (65)-N	0.012"	_____
_____	0.016"	BUSHING (64)-R	0.003"	_____
_____	0.009"	III WHEEL (26)	_____	_____
_____	0.016"	RING (86)-N	0.015"	_____
_____	0.009"	BUSHING (60)-R	0.003"	_____
_____	0.016"	II WHEEL (32)	_____	_____
_____	0.008"	RING (61)-N	0.015"	_____
_____	0.017"	BUSHING (60)-R	0.008"	_____
_____	0.006"	I WHEEL (85)	_____	_____
_____	0.006"	RING (58)-N	0.015"	_____
_____	_____	RING (17)-H	0.006"	_____
_____	_____	BUSHING - G	0.006"	_____
_____	_____	JOURNAL BEARING	F	0.007"
_____	_____	GUARD (44)-T	_____	_____
_____	_____	COUPLING TURBINE END	_____	_____

Total float of rotor = 4.90mm

S. NO.		QTY.		DES.		SIZE		MATERIAL	
INDIAN FARMERS FERTILISER CO-OP. LTD. KALOL									
NAME		DATE		PLANT		EVR NO.			
KAM		14.3.80		RUNNING CLEARANCES OF		BEARING LABYRINTH BEFORE AND AFTER OVERHAULING OF 105-J			
SCALE-		L.P. CASE		DRAWING NO. 01 02 07 07 01 01					
DRW. BY		CHKD.		APD.		PLANT		FORM	
KAM						NUMBER		SHEET	
						REV.			

NOV-DEC 1992

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RECOMMENDED CLEARANCES

REF.	CLEARANCE	BETWEEN
A	0.018" TO 0.024"	SHAFT AND GUARD (1)
B	0.014" TO 0.017"	SHAFT AND HOUSING
C	0.004" TO 0.007"	SHAFT AND BEARING
D	0.004" TO 0.006"	SHAFT AND BUSHING
E	0.015" TO 0.019"	SHAFT & RING (38 & 32)
K	0.025" TO 0.029"	WHEEL (13, 20, 24), RINGS (77, 78, 75, 76, 272)
L	0.020" TO 0.024"	WHEEL (13, 20, 24 & 31) BUSHINGS (70 & 71)
M	0.020" TO 0.024"	BUSH (71 & 74), SPACER (25), SHAFT
P	0.002" TO 0.004"	SHAFT AND GUARD (55)
S	0.013" TO 0.017"	RING (80) AND RING (81)

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	AFTER	BEFORE	COUPLING G.B. SIDE	BEFORE	AFTER
OIL GUARD (1)-A					
JOURNAL BEARING - C			CLEARANCE 0.004" TO 0.007"		0.004" (Dia.)
RING (32)-E	0.004"	0.008"		0.000"	0.007"
RING (80)-F	0.004"	0.008"		0.008"	0.006"
RING (81)-S	0.007"	0.010"		0.002"	0.005"
WHEEL (13)				0.012"	0.012"
CASE RING (78)-K	0.012"	0.012"		0.010"	0.012"
BUSHING - L	0.012"	0.011"			
WHEEL (13)				0.015"	0.014"
RING (77)-K	0.014"	0.015"		0.010"	0.012"
BUSHING (71)-L	0.014"	0.011"			
WHEEL (20)				0.014"	0.014"
RING (76)-K	0.014"	0.014"		0.009"	0.012"
BUSHING (71)-L	0.012"	0.009"			
WHEEL (24)				0.014"	0.014"
RING (75)-K	0.014"	0.014"		0.008"	0.012"
BUSHING (74)-M	0.014"	0.010"			
WHEEL (24)				0.014"	0.012"
RING (72)-K	0.014"	0.010"		0.010"	0.010"
BUSHING (71)-M	0.012"	0.010"			
WHEEL (31)				0.010"	0.006"
BUSHING (70)-L	0.012"	0.010"			
WHEEL (35)				0.005"	0.004"
RING (38)-E	0.006"	0.003"			0.004"
JOURNAL BEARING - C					(Dia.)
GUARD (55)-P					
AXIAL FLOAT WITHOUT SHOES 1/2"			THRUST BEARING	TOTAL END PLAY 0.009" TO 0.013"	0.015"
			RING (51)-P		0.007"

New Shims : Active Side - 0.38
 Nonactive Side - 0.36
 Total Float : 6.08mm.

INDIAN FARMERS FERTILISER CO-OP. LTD. KALOL

S.N.O. _____ DTY. _____ DES. _____ SIZE _____ MATERIAL _____

NAME _____ DATE _____ PLANT _____

DRN. KAM 1738G

CHD. _____

ADD. _____

SCALE: _____

DRAWING NO. _____

H.P. CASE _____

PLANT FORM _____ NUMBER _____ SHEET _____

RUNNING CLEARANCES OF _____

BEARING LABYRINTH BEFORE AND AFTER OVERHAULING OF 105-J

ENR NO. _____

NOV-DEC 1992

RECOMMENDED CLEARANCES

LETTER	MIN.	MAXI.
A	0.002"	0.004"
B	0.010"	0.012"
C	0.015"	0.021"
D	0.077"	0.110"
E	0.010"	0.022"
F	0.013"	0.019"
G	0.015"	0.018"
H	0.089"	0.099"
J	0.151"	0.161"
K	0.035"	0.045"
L	0.115"	0.125"
M	0.091"	0.159"
N	0.006"	0.008"

MECH AMM SD REPORT
NOV 1992
-9

		103-J LP CASE SIDE		COUPLING			
	AFTER	BEFORE		BEFORE	AFTER		
			JOURNAL BEARING	0.007"	0.006"		
			GUARD (205)-C				
	0.010"		GUARD (233)-D		0.008"		
	0.008"	0.012"	BOTTOM-F RING (234)	0.010"	0.006"		
	0.010"	0.006"	TOP-E RING (221) BOTTOM-F	0.008"	0.006"		
	0.002"	0.006"	TOP-E RING (221)	0.008"	0.004"		
	0.006"	0.006"	BOTTOM-F RING (212) BOTTOM-F	0.005"	0.004"		
	0.008"	0.006"	TOP-E RING (212)	0.005"	0.006"		
			2ND WHEEL				
	0.010"	0.016"	BOTTOM-F RING (433)	0.010"	0.008"		
	0.008"	0.012"	TOP-E RING (433) BOTTOM-F	0.008"	0.010"		
			1ST WHEEL				
			NOZZLE RING				
	Ring dia: 7.270" φ	Shaft dia: 7.265" φ	Clearance: 0.005"	RING (146)-G	0.009"	7.265" φ	7.274" φ
	7.206" φ	7.202" φ	0.004"	RING (147)-G	0.008"	7.202" φ	7.210" φ
	7.154" φ	7.148" φ	0.006"	RING (148)-G	GLAND BOX 0.009"	7.148" φ	7.157" φ
	7.081" φ	7.076" φ	0.005"	RING (149)-G	0.007"	7.076" φ	7.083" φ
	7.052" φ	7.045" φ	0.007"	RING (150)-G	0.008"	7.045" φ	7.053" φ
	0.008"	0.014"	BOTTOM-F RING (212)				
	0.008"	0.018"	TOP-E RING (221) BOTTOM-F				
	0.006"	0.012"	TOP-E RING (221)				
	0.004"	0.010"	BOTTOM-F RING (234) BOTTOM-F				
	0.010"	0.016"	TOP-E RING (234) BOTTOM-F				
	0.004"/0.006"		GUARD (232)-D				
			GUARD (296)-C				
			JOURNAL BEARING	0.013"	0.011"		
			GUARD (291)-A				
			THRUST BEARING	0.018"			
			COUPLING				
			103-JBT SIDE				

Total Float = 4.55mm

DRAWING NO.		SCALE - N.T.S.		INDIAN FARMERS FERTILISER CO-OP. LTD. KALOL	
DRN. KAM	10-4-80	NAME	DATE	DES.	SIZE
CHD.		PLANT			
APD.					
RUNNING CLEARANCES OF BEARING LABYRINTH BEFORE AND AFTER OVERHAULING OF		103-JAT		MATERIAL	
FORM NUMBER		SHEET		EVR NO.	
010208048		11			

PLANT TURNAROUND - NOVEMBER - 1992

81

UREA PLANTMECHANICAL JOBSJOB CODEJOB DESCRIPTION02 01 01 CENTRIFUGAL COMPRESSOR - K-1101/1 :

This compressor was taken for complete overhauling. Cover was removed and rotor was taken out. Following parts were changed due to more clearance observed.

01) Seal ring P.No. SSS 44656/3 - 1 set

02) Seal ring P.No. SSS 44657/3 - 1 set

Compressor was boxed up after cleaning all scaling. Coupling was also cleaned and refitted. Clearance of the shaft with seal rings is enclosed as Annexure - I.

Coupling half towards turbine was replaced because teeth were found damaged.

ANNEXURE - ILAYBRINTH CLEARANCE K-1101/1 - COUPLING SIDE

0.25,0.20,0.15	E	0.25, 0.15, 0.20	NORTH
0.15	F	0.15	
0.65	L	0.40, 0.25	
0.30	G	0.30	
0.50	M	0.50	
0.60	G	0.60	
0.45	N	0.45	
0.40	I	0.40	
0.40	I	0.40	
0.35	N	0.35	
0.35	D	0.60	
0.25	H	0.35	
0.60	D	0.40	
0.30,0.80	H	0.60	
0.95	D	0.95	
0.10,0.15,0.15	F	0.2, 0.3, 0.2	
0.10	E	0.10, 0.15	

- NOTE:-
- (1) All readings are in MM
 - (2) More than one reading indicates clearances on different teeth of one labyrinth.
 - (3) Reading of F is after changing the labyrinth with new one.

JOB CODE

JOB DESCRIPTION

- 01 Axial play of the rotor was found 0.014" before fixing the covers of the bearings and after complete box up the thrust found was 0.0125".
- 02 Inboard bearing clearance (coupling side) was found 0.008"
- 03 Outboard bearing clearance (free end) was found 0.008"
- 04 Total rotor movement without thrust brg. 0.145"
- 05 Thrust with thrust brg. in position and rotor pushed to free end side 0.054"
- 06 Rotor position is kept at thrust clearances 0.099" coupling side and 0.046" free end side.
- 07 Clearance between wheel and gland seal 1.4 MM (by filler gauge)
- 08 Clearance between fourth (coupling side) wheel and gland seal 3.6 MM (Rotor pushed to thrust brg. side)
- 09 Clearance between first (coup. side) wheel and gland seal (rotor pushed to coupling side) 4.7 MM (by filler gauge)

02 01 02

P.B. COMPRESSOR K-1101/2 :

- 01 First stage gas packing cups were dismantled and gas packing was changed as there was leakage of gas from gas packing. Wiper packings checked and found okay.
- 02 Second stage was dismantled as there was leakage from gas packing and cooling water flow was restricted. Gas packings were found worn off and damaged. Set of gas packing cups with new "O" rings and gas packing were changed as found worn off and scored. Piston ring were changed as the end gap of the piston rings was found more (maxi. 0.180") Piston also found scored at the point of piston ring slot but was in acceptable limits. End gap of new piston rings was observed maxi. 0.080" and min. 0.048".
- 3) Third stage was taken for overhaul due to heavy leakage from gas packing. Gas packing and gas packing cups were found worn off and scored. Both were changed with aluminium gasket and "O" rings.

Coupling pads were changed and new coupling pads were put in service supplied by M/s. Holeset, as SM 80. Old coupling pads were found distorted. When compressor started with SM 80 coupling pads, the vibrations were found very high. About 100 hours of running of comp. at 80% load on checking the coupling pads, they were found badly distorted and cracked. Hence, these were replaced by old SM 60 (average hardness 65 SHORE A) & new SM 45

average hardness was 50⁰ SHORE A) were installed. On running the compressor vibration came to normal.

Manzil lubricator was overhauled and refitted after cleaning. Its oil sump was also cleaned. All suction and discharge valves of all three stages were changed. Cooling water jackets of each stage was cleaned and flushed.

02 01 03 GHH COMPRESSOR - K-1001 :

01 Coupling pads were replaced and new pads supplied by M/s.Arviso Rubber, Bombay are put in service to check the performance of indigeneous pads.

02 02 01 TURBINE TAKEN FOR OVERHAULING :

01 Amm.pump turbine Q-1102/A - Cover was removed and rotor was taken out. Rotor wheel's locking circlips on both sides found bend and loose hence, the rotor was changed. Carbon rings were also found worn off, hence changed.

02 Carbamate pump turbine Q-1201/B - Cover was removed and rotor was taken out. Carbon rings were found worn off. Both the journal brgs. were found damaged, but the shaft was found okay. Both journal bearings were changed.

TURBINE OVERHAULING Q-1102/A & 1201/B :

	Q-1102-A	Q-1201/B
01 Parts replaced	i) Set of carbon rings - 2 sets	(i) Set of carbon rings - 2 sets
	ii) Rotor assembly	(ii) Ball bearing 6311 - 1 No
	iii) Ball bearings 6311 - 1 No	(iii) Journal brg. - 2 Nos
		(iv) Governor linkage spring - 1 No.
		(v) Trip finger assbly.- 1 No

02 Journal brg.clerance	Gov.side	GB side	Gov.side	G.B.sideP
	0.004"	0.006"	0.009"	0.007"

03 Nozzle clearance

a) Before removing rotor.	0.063"	0.069"
---------------------------	--------	--------

	b) After putting the rotor	0.067	0.069"
04	Brg.thrust	0.020"	0.012" Total float 0.118"
05	Over speed trip done at	4550 RPM	4600 RPM

02 02 02

Turbines taken for preventive maintenance.
Following turbine were taken for preventive maintenance.

JOURNAL BEARING CLEARANCE

SR NO.	DESCRIPTION	PUMP/COMP SIDE	FREE END	THRUST BRG.CLRN.	PARTS CHANGED
01	PB COMP.TUR. Q-1101/2	0.006"	0.006"	Before overhauling 0.012" After overhauling 0.012" COUPLING FLOAT 11.00 MM	
02	Centrifugal Comp.Turbine	0.006"	0.006"	0.012" 0.012" COUPLING FLOAT 0.065"	Geared coup- ling half
Note:- Starting device overhauled as the tripping function was not working properly.					
03	GHH COMP. turbine Q-1001	0.007"	0.006"	0.010"	coupling bolt 1 No
04	Carbamate pump turbine Q-1201/A	0.005"	0.006"	0.016"	-
05	GHH L.O.Pump turbine Q-1051-A	Overspeedtrip ----- 3500 RPM		Speed set ----- 2900 RPM	

Parts changed for above turbine :

- 01) Carbon seal rings - 8 Nos (2 sets)
- 02) Both Ball brg.changed (a) 1211C3 - 1 No (b) 6310 - 1No
- 03) Governor coupling pad (5 ton) - 1 No
- 04) PTFE seal packing at both end of the thrust brg.

Note :- Gasket between governor and turbine was replaced by M.S.Plate of 5 MM thick in order to have proper float with the coupling.

06 PB Compressor 1900 RPM 1450 RPM
Turbine Q-1113/A

Parts changed :- Brgs. (i) 6204-1 No (ii) 6205-1 No,
(iii) 6206 - 1 No (iv) 6208 - 2 Nos

02 02 03 AMMONIA AND CARBAMATE PUMP :

Crank cases of these pumps were opened for preventive maintenance.

EQUIPT.NO.	CRANK SHAFT THRUST		PART REPLACED
	BEFORE O/H	AFTER O/H	
P-1102-A	0.064"	0.028"	Set of thrust brg. as this was found damaged.
P-1102-B	0.022"	-	Set of main brg.as this was found damaged.
P-1201-A	1.8 MM (Journal by 0.008") big end by 0.006"	0.58 MM	Set of thrust brg.(old found damaged on thrust side.Shoe guide clearance 0.016" - 0.018" Sump cleaned & new oil filled.
P-1201-B	1.8 MM	0.84 MM	1) Set of thrust brg. 2) Set of big end brg. (first from thrust brg.)(Old brg.was found damaged cl.of new brg.found 0.007") Also cl.of new journal brg.found 0.012"(old brg.cl.was 0.012") Cross head showe guide clearance 0.016" - 0.018" Sump cleaned and oil changed.

Other jobs done :-

P-1102-A :- All Non return valves of lube oil to H.P. barrel overhauled.Oil of force feed lubricator changed & sump cleaned.

P-1102-B :- 1) All non return valves of lube oil to H.P. barrel overhauled. Oil of force feed and sump cleaned.

2) Plunger packings of L.P.and H.P.barrel changed with "O" rings.

02 02 04 GEAR BOX OF OIL COOLER OF P-1201-A :

01 Two tubes of lube oil cooler of gear box were found leaking corroded and hence were plugged. Cooler was hydrotested by cooling water. Due to leakage, gear box was filled with cooling water. The gear box was overhauled. On inspection the journal brg. of high speed pinion were found damaged, hence replaced. Sump was cleaned and new oil filled.

02 02 05 01 O/H OF CRANK CASE LUBE OIL PUMP OF P.B.COMP.P-1123 :

This was overhauled because of the motor overhauling and broken foundation. New foundation is made and new base plate provided. Mechanical seal overhauled. Following parts changed. (i) Rubber bellow (ii) Carbon, (iii) Carbon "O" Ring (iv) Square seal.

02 03 01 OVERHAULING OF PRILL BUCKET SHIFTING DEVICE - M-1401 :

01 This was taken for complete overhauling. The system was cleaned and greasing was done. Following parts replaced.

Ball Brg.No.6317 with C3 clearance	- 2 Nos)
Ball Brg.No. 7314	- 2 Nos) Prill
Oil seal 62 x 85 x 12	- 2 Nos) bucket
Oil seal 105 x 130 x 13	- 2 Nos) shaft
Oil of variation checked	

02 Prill Cooling system :- Preventive maintenance of the system is done. Brg.of inlet air fan and exhaust air fan checked and found okay. Vee belts of exhaust air fan (SPC 6300 - 8 Nos) changed as the belts were elongated and damaged. Butterfly valves operating mechanism of dust collecting silos were also cleaned, greased and oil changed.

02 03 03 SCRAPPER - M-1402 :

01 Oil of main gear checked & found okay.

02 Both gear box oil checked and oil topped up.

03 Hydraulic coupling of M-1401-A was changed due to oil leakage from the oil seal.

04 Set of V-belt B-69 of both scraper changed.

02 03 01 PRILL TOWER FAN - K-1401, 1,2,3, & 4 :

Preventive maintenance of brgs done. All brg. were okay. Provided grease nipple for greasing in the brg. Also provide thrust ring in one brg. which was not there.

02 04 01 K-1101/ 1 & 2 (T-1111) :

Main lub oil console oil was drained through pump (not centrifuge)

Bottom level oil was removed manually by buckets & mopping.

Main tank and overhead tank were cleaned with soft scraper and diesel. Oil coat was sprayed inside the overhead tank after diesel cleaning.

Total 53 drums were collected - 51 drums were collected from main console and 02 drum from over head tank.

Informed production and clearance taken.

OIL CHARGE :-

Charged the same removed oil. The removed oil had settled in drums and three (3) inch bottom oil level in each drum as left out while charging the oil into the tank.

Oil 09 Nos new fresh oil SERVOPRIME - 68 was added into the tank as make up oil. Oil was filled into the tank upto top of oil level gauge. 06 Nos oil drums were kept near the console for topping up during plant start.

TIME FACTORS :

- a) Removal of oil through pump 16 hrs
- b) Removal of oil from Main L.O.tank and overhead L.O.tank manually by buckets & mopping - 12 hrs
- c) Cleaning of Tanks (02) - 06 hrs with hight scraper
- d) Cleaning with Diesel both tanks - 16 hrs
- e) Charging oil - 19 hrs

The above timing excludes breaks for lunch,tea, and connection and disconnection of hoses,manhole etc.

02 13 00 FLUIDISED BED COOLER :

Window provided inlet side(road side)for cleaning of the fluidised bed.

02 14 00 STEAM LEAKS,CONDENSATE LEAKS :

Jobs were attended as per instructions of production from time to time during the shutdown.

02 16 00 STRAINERS / FILTERS :-

The following strainers/filters were cleaned.

- 01 H-1206 strainer in C.W.line
- 02 V-1102 Amm.suction filter - filter cloth replaced with new one.
- 03 P-1123 and both strainers were cleaned.
- 04 Suction strainer to P-1102-A
- 05 Discharge strainer to P-1102-A replaced the filter element as the old one found broken and strainer of P-1102-B checked and cleaned.
- 06 Ejector inlet to H-1425 opened for cleaning.
- 07 Suction strainer of P-1113-A&B of tank T-1111
- 08 Suction strainer of E-1051 A & B of GHH lube oil console.
- 09 Oil filters of gear box and pumps of P-1102 A & B and P-1201-A & B.

02 17 01 Following NRV were overhauled

- 01 Discharge line of P-1202-B
- 02 Discharge line of P-1201-A. This was found in totally broken condition. Its lever and arm made new and seat was lapped.
- 03 CO2 to H-1201
- 04 NH3 to H-1202
- 05 Carbamate to H-1202
- 06 NH3 to V-1201
- 07 Carbamate to H-1203
- 08 CO2 to H-1203
- 09 GHH Compressor discharge-plate of this valve found broken, hence new valve is installed.
- 10 P-1204 A & B discharge.
- 11 P-1501 and P-1506 discharge line.

02 17 02 R.V. TESTED / OVERHAULED :

Following RVs were overhauled and tested at workshop and reinstalled.

	<u>Popping pressure</u>	<u>Reset pressure</u>
01 RV-1202-A,B, & C	6 Kgf/cm ²	5.5 Kgf/cm ²
02 RV-1201-A,B & C	2350 PSI	2250 PSI
03 RV-1504 9 Ata Saturator	12 Kgf/cm ²	11 Kgf/cm ²
04 RV-1503-23 Ata saturator	25 Kgf/cm ²	24 Kgf/cm ²
05 RV-1102-Amm.Suction vessle	31 Kgf/cm ²	28 Kgf/cm ²
06 RV-1108 & RV-1110 Cold amm.line	31 Kgf/cm ²	28 Kgf/cm ²
07 RV-1121 RV installed on V-1111	15 Kgf/cm ²	14.5 Kgf/cm ²
08 RV-1122 RV installed on V-1112	5.5 Kgf/cm ²	5 Kgf/cm ²
09 RV-1207 steam exhaust to Q-1201/A	6 Kgf/cm ²	5.4 Kgf/cm ²
10 RV-1203 suction to P-1201-A	8.5 Kgf/cm ²	7.65 Kgf/cm ²
11 RV-1204 suction to P-1201/B	8.5 Kgf/cm ²	7.5 Kgf/cm ²
12 RV-1205 Discharge of P-1201-A	161 Kgf/cm ² 2300 Psi	145 Kgf/cm ² 2150 Psi
13 RV-1201 Discharge to P-1201-B	161 Kgf/cm ² 2300 Psi	145 Kgf/cm ² 2150 Psi

02 17 03 COOLING WATER LINE VALVES REPAIRED/REPLACED :

- 01 Jump over C.W.valve - The gland followers of this valve were broken. These were replaced and valve overhauled. Drific upstream to this valve also opened and found clear.
- 02 8" N.B. C.W. to H-1104 I/V replaced as its spindle was broken.
- 03 12" N.B. butterfly valves to H-1207, both are replaced by new one as the old valves were passing due to damage in seat.

U-8

02 17 04 REPLACEMENT OF I/V :

- 01 Suction valve P-1102-B (Second I/V - 6" 300 # flanged C.S. gate valve)
- 02 Level trol I/V of Amm.sunction vessel (1 1/2" NB 800 # gate valve)
- 03 Suction valve of P-1201-A & B (4" 150 # S.S.gate valve)
- 04 Desorber drain valve 1 1/2" SS gate valve.

02 17 05

Following high pressure flushing valves were attended for passing . These were opened and seat was machined in position after necessary welding deposite. Valve was again assembled after lapping of the seat and changing the spindle, if needed.

- 01 Autoclave unloading IInd I/V size 2" N.B
- 02 " " Ist I/V size 2" NB
- 03 " " drain bleeder 1" N.B
- 04 " " sample point 1st I/V 1"
- 05 Stripper sample point 1st I/V - 1"
- 06 Stripper sample point 3rd I/V - 1/2"
- 07 Unloading line from Autoclave - 1"
- 08 Discharge valve of P-1201-B IInd I/V - 3"
- 09 Discharge valve of P-1201-A IInd I/V - 3 "
- 10 Carbamate common line IInd I/V - 1"
- 11 Recycle valve P-1201-A
- 12 Recycle valve P-1201-B
- 13 CO2 to HP scrubber both I/V - 1"
- 14 Autoclave seal to HPP sccond I/V - 1"
- 15 PRC-1201

02 17 06

Following valves were made motor operated. Hence, their bonnet was removed and refitted after necessary modification done by technical deptt.

- 01 40 ata steam I/V to Q-1201-A
- 02 Sample to P-1201-A&B - 3" Taylor valve seat replaced

03 T-1501 - Steam condensate tank

- 1) Impingement at the bottom found detached. This was welded to the bottom. Necessary preheating was done to ensure sound weld.
- 2) 2" N.B. distributor pipe support found broken. This was repaired.
- 3) 6" dia pipe stiffeners found broken. These were welded.

02 19 03 Following vessels (Low pressure) were opened, cleaned and inspection done and boxed up.

01 V-1301 - Desorber

02 V-1202 - Rectifying column

03 V-1423 - 1st evaporator scrubber - Demister pads are found damaged and now needs replacement

04 V-1101 - CO2 knock out drum

05 V-1421 - Flash tank scrubber

06 V-1206 - L.P. Vent scrubber

07 V-1203 - L.P. absorber

08 V-1103 - Amm. suction vessel

09 V-1502 - 23 ata steam saturator

10 V-1204 - L.P. scrubber.

11 V-1503 9 ata steam saturator

02 19 04 Following vessels replaced

01 Centrifugal compressor intercooler separator V-1111 and after cooler separator V-1112 both vessels replaced with new ones and new level gauges were provided.

02 First stage suction dampner of GHH Compressor replaced with new one.

02 20 01 PIPE LINES/PIPE FITTINGS REPLACED/MODIFIED :

01 Part of common suction line to carbamate pumps from V-1205 is replaced with new as the old line was thin and was leaking from several points. The remaining part of suction line was replaced in Sept, 91, and hence, now the total line has become new. Steam tracing line also replaced.

JOB CODE

JOB DESCRIPTION

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- 02 Discharge line of P-1401 (Urea solution line) is replaced up to Urea solution filters V-1409 A & B Part of steam tracing line which was corroded badly was also replaced.
- 03 P-1505 Condensate to H-1422 - 2" N.B. C.S. line was badly corroded, hence replaced.
- 04 8" N.B. C.W. line modification done. Direct connection from main header to inlet H-1422 is taken now.
- 05 4" C.S. line from V-1501 to LC 1502-A is replaced as thickness of elbows were found less.
- 06 A new 1" N.B. C.S. drain line provided from vent silencer SM 286 up to drain at ground floor.
- 07 4" C.S. elbow of 23 ata condensate line to 9 ata drum is replaced by new as the thickness was found less on thickness measurement.
- 08 Exhaust line of RV 1201 AB and C is increased in length so that exhaust can be seen clearly (6" N.B. SS line)
- 09 Steam vent of ejector of centrifugal compressor (4" N.B. C.S. line) is made 4 MTS. further high as the steam was heating incoming CO₂.
- 10 Oil line from crank case sump to suction of oil pump (1 1/2" N.B. SS) line is provided replacing hose connection in P-1201 A and P-1102-A.
- 11 In autoclave off gas line elbow (first upstream of RV-1201 A/C&B) was replaced as wall thickness was found very less. One tee (down stream of RV-1201 ABC) was also replaced as the thickness was found very less.
- 12 2" N.B. S.S. carbamate drain line to amm. water tank from first floor (Up to vertical portion only) was replaced leakage was observed from the line and on inspection fisher cracks were observed on the pipe.
- 13 Vent line of suction vessel RV of amm. pump is disconnected from carbamate pump RV vent line and connected to amm. system RV vent line (3" S.S. line)
- 14 10" S.S. line from first stage separator (P.B.) upto bifercation tee (bifercation to GHH) (Tee not included) line is changed.

- 15 Discharge line of Amm.pump R-1102 A&B isolation valve position changed for easy depressuresation (Spool piece provided between valves where as earlier both valves were together towards common discharge side) and drain point with valve & blind flange provided in both spool piece. Discharge strainer of P-1102-A was provided with pressure gauge with isolation valve.
- 16 Vent line of flush tank ejector joined to vent stack.
- 02 31 01 01 Following Heat exchangers were opened,hydrojetting done and boxed up.
 - 01 Surface condenser H-1114
 - 02 CO2 spray cooler H-1104
 - 03 1st evaporator seperator H-1422
 - 04 1st evaporator seperator H-1424
 - 05 Circulation heater H-1204
 - 06 Vent condenser H-1502
 - 07 Flash tank condenserH-1421
 - 08 1st evaporator condenser H-1423
 - 09 IInd evaporator 1st condenser H-1425
 - 10 IInd evaporator , IInd condenser H-1426
- 02 Following L.O.Coolers were opened,hydrojetting done & boxed up
 - 01 Crank case cooler of GHH Comp. H-1052 A & B
 - 02 GHH main oil cooler H-1051 A & B
 - 03 PB Comp.crank case cooler H-1123 A & B
 - 04 PB & Centrifugal main oil cooler H-1113 A & B
 - 05 Carbamate pump L.O.cooler H- A & B
 - 06 Amm.pump L.O.cooler H A & B

Note:- item No. (ii) and (iii) were opened for inspection and cleaning only.

Heat exhcngers were hydrojet cleaned (Party M/s.Nutech Jetting).Details of time taken for cleaning by hydro-jetting are given below.

SR.	EQUIPMENT	T I M E		M/C
		HRS	MINUTES	
01	H-1123	03	15	DIESEL
02	H-1114	19	15	"
03	H-1051-A/B	04	10	"
04	H-1152-A/B	05	50	"
05	H-1113-A/B	06	20	"
06	H-1204	16	00	"
07	P-1231 B/P-1230-B	05	35	"
08	H-1502	13	10	"
09	H-1421	12	15	"
10	H-1425	76	00	"
11	H-1423	10	40	"
12	H-1426	11	30	"
TOTAL		184 HRS	00 MIN	

UREA PLANT
INSPECTION JOBS

JOB CODE	JOB DESCRIPTION
02 41 01	<p>The following vessels were internally inspected. The observations are noted below.</p> <p>(a) <u>V-1101 CO2 KNOCKOUT DRUM:</u></p> <p>(i) The condition of the demister pads was found satisfactory.</p> <p>(ii) Peeling of epoxy paint was observed on the west side of shell internal surface in appx. 3 Sq. Inch area.</p> <p>(iii) The overall condition of the vessel was good.</p> <p>(iv) Ultrasonic thickness measurement of the shell and dished ends was carried out from outside. The detailed report has been made.</p> <p>(b) <u>H-1104 CO2 SPRAY COOLER:</u></p> <p>(i) Demister pad assembly was found in good condition.</p> <p>(ii) Condition of the epoxy paint was found satisfactory.</p> <p>(iii) All fittings were intact in position.</p> <p>(iv) Thickness measurement was carried out. The report has been made.</p> <p>(c) <u>V-1301 DESORBER:</u></p> <p><u>BOTTOM:</u></p> <p>(i) The bottom shell of the vessel had assumed redish brown colouration.</p> <p>(ii) Bottom tray and the supports were found to be in good condition.</p> <p>(iii) All weld joints of the bottom compartment were found to be in good condition.</p>

TOP:

- (i) The colouration of the shell was observed to be grayish black.
 - (ii) Trays at the top were found to be intact in position.
- Thickness measurement of the shell and bottom dished ends was carried out and report has been made.

(d) V-1421 FLASH TANK SCRUBBER:

- (i) The vessel internal colouration was found to be brownish.
- (ii) The demister pad was found to be in good condition except minor sagging of some segments.
- (iii) Internal fittings and supports were found intact.
- (iv) Circumferential weld seam below manhole was found flush with the parent metal in Southeast area.

(e) V-1423 1st STAGE EVAPORATOR SCRUBBER:

- (i) Demister pad segments were found to have displaced at two locations.
- (ii) The shell inside surface was found brownish red.
- (iii) Two nos. of bolts of the tray segment on North side were found missing.
- (iv) Minor pitting was observed on tray support weld joints in scattered areas.
- (v) Ultrasonic thickness measurement of the shell was carried out. The report has been made.

(f) H-1422 1st STAGE EVAPORATOR SEPARATOR:

- (i) The shell has assumed blackish colouration.
- (ii) The overall condition of the vessel weld joints was good.
- (iii) The condition of the distributor baffles at the top nozzle was good.
- (iv) The centre cone supporting angles and pipes were intact in position. The welding of reinforcement plate with the shell was good.
- (v) The seal welding of the tubes with the top tubesheet of the exchanger was found to be free from any defects.

(vi) The overall condition of the vessel was good.

(g) H-1424 II nd STAGE EVAPORATOR SEPARATOR:

(i) The shell inside surface was found blackish.

(ii) Circumferential weld joint of the shell was found flush with parent metal in appx. 4 feet length on south side and 2 1/2 feet length on north side.

(iii) One no. tube stub end was found eroded at the top tubesheet centre. Seal welding of remaining tubes were good.

(iv) The overall condition of the vessel was found satisfactory.

(h) V-1202 RECTIFYING COLUMN:

(i) Only top cover was opened for inspection. The condition of the wiremesh was good.

(ii) The internal surface of the vessel shell was found free from corrosion and erosion.

(iii) The overall condition of the vessel top compartment was satisfactory.

(i) V-1203 LP ABSORBER:

(i) No corrosion/erosion was observed on shell surface.

(ii) Grills surface covering the rings were found intact.

(iii) The shell had assumed blackish colouration.

(iv) All the weld joints were found to be in good condition.

(j) V-1502 23 ATA STEAM DRUM:

Visual inspection, magnetic particles testing and ultrasonic thickness measurement were carried out. Following are the observations.

(i) The vessel had assumed brownish black colouration.

(ii) The weld joints were found satisfactory. However underflushing was observed on HAZ (i.e. of parent metal) on circumferential as well as longitudinal weld seams.

(iii) The weld joints of the top and bottom distributor pipes were found to be in good condition as seen visually.

- (iv) Both the dished ends were found to have been manufactured in two pieces. Detached millscale marks were found on East side dished end.
- (v) Magnetic particles testing of the vessel weld seams and nozzle weld joints was carried out. No defect was observed on shell weld seams. However, lack of fusion like laminar defect was observed on West side manhole nozzle-weld joint from inside of the vessel. This defect was also found in 91-Shutdown. The extent of this was confirmed by DPT and defectometer also to assess any increase. The length of the defect was found to be 10 inches as it was observed in last shutdown including its width.
- (vi) Thickness measurement report has been made.

(k) T-1501 CONDENSATE TANK:

Visual inspection, MPT of weld joints and ultrasonic thickness measurement were carried out. The observations are noted below.

- (i) The colouration of the shell was found to be brownish black.
- (ii) Condensate inlet pipes (6" NB Size- 2 nos.) strip supports were found to have got sheared.
- (iii) Impingement plate below both the inlet pipes got detached from shell.
- (iv) Distributor pipe (2" NB Size) clamp which was welded with channel support inside the shell had got detached causing line to rest on the shell bottom.
- (v) Overall condition of the vessel weld seams was satisfactory as seen visually.
- (vi) Magnetic particles testing of the weld joints was carried out. No defect was observed. The area which was repaired during Feb-March, 91 shutdown was also tested by MP. No defect was observed. The report of MPT has been made.
- (vii) The ultrasonic thickness measurement of the shell and dished ends was carried out. The report has been prepared.

(l) V-1503 9 ATA STEAM DRUM:

Visual inspection, MPT and thickness measurement were carried out. The following are the observations.

- (i) The internal colouration of the steam drum was observed to be brownish black in general.
- (ii) Top and bottom distributor pipe weld joints were found to be in good condition.
- (iii) All internal fittings were found intact and in good condition.
- (iv) Scattered pittings were observed on both the dished ends.
- (v) Magnetic particles test of all the weld joints was carried out. No defect was revealed. The test report has been prepared.
- (vi) Thickness measurement report has been prepared.

(m) V-1205, LP CARBAMATE SEPARATOR:

The vessel was opened for inspection from inside as carbamate leakage was observed from gas outlet nozzle reinforcement pad and was attended from outside earlier. The following tests were carried out and the observations are listed:

- (i) One 10" long crack was found in the top dishend under the reinforcement pad. D.P.test of the complete dishend was carried out to locate the extension of the crack and to ascertain the presence of any other crack. But no other crack was observed.
- (ii) The 2"dia. nozzle was found to have no welding with the dishend from inside.
- (iii) The 2"dia. nozzle pipe which was repaired earlier due to carbamate leakage was found to have got cracked from inside. The reinforcement pad of the nozzle was removed by grinding including the nozzle. The dish-end crack was repaired by welding. The nozzle was replaced with new one and was welded with dish-end from inside and outside. The nozzle weld including outside of the dish-end was DP-tested. Then a new pad was welded. D.P.test of the welding was done.
- (iv) The shell and bottom dished end surface was quite smooth and free from corrosion or erosion.

- (v) D.P.test of all the weld joints of bottom dished end was carried out. One no. of pinhole was noticed in 1" Dia. nozzle welding with shell just above the bottom dish-end from inside. This was repaired by welding and then final D.P.test was carried out.
- (vi) Top dished end was completely D.P. tested in order to find out any other defects in it. no other defect was observed.

(n) V-1103, AMMONIA SUCTION VESSEL:

- (i) The colouration of the internal surface of the vessel was found to be blackish brown.
- (ii) Scattered shallow dents at few places were observed on shell surface.
- (iii) Overall condition of the vessel was found satisfactory.
- (iv) Magnetic Particles testing of the vessel weld joints was carried out for S.C.C.(Stress Corrosion Cracking). No defect was observed.
- (v) Ultrasonic thickness measurement was carried out. The report has been prepared.

02 41 02 [B] Inspection of HP vessels viz.

(1) HP Condensor, H-1202

(2) Autoclave, V-1201 and

(3) HP Stripper gas inlet nozzle was carried out.
The following are the observations:

(a) H-1202, HP CONDENSER:

- (i) Visual inspection of the top and bottom compartments was carried out. The report has been prepared.
- (ii) All the weld repairs done on cleat and gasket lip seal weld joint were DP-tested. Ferrite measurement on the same was also done. No ferrite was observed.
- (iii) Repairs were carried out on tube stub-end seal welding and also on the welding of four nos. of tube-plugs at the top tubesheet. DP test of top and bottom tube-sheet including the repair welding was carried out.
- (iv) Eddy current scanning of tubes in appx. 1 metre length from top was carried out to find out the thinning of the tubes inside the tubesheet area. The report on Eddy Current test carried out by IFFCO, Aonla team has been prepared.

- (v) Hydrotest from shell-side was carried out to ensure the defect free repairs and to check the soundness of the tubes.
- (vi) Air and soap solution test was carried out by pressurising the annular space between the liner and top channel cover at 3 PSI. The weld seams of the liner were applied with soap solution to reveal the leakage, if any. No defect was observed.
- (vii) Ultrasonic thickness measurement of the liners and thickness measurement of the cladding with the help of Permascope was carried out. The report has been prepared.
- (viii) Ferrite measurement of the weld joints inside the top and bottom compartments was carried out. Nil ferrite was observed.

(b) H.P. STRIPPER, H-1201 :

- (i) Visual inspection of the liquid inlet nozzle was carried out from outside. The cladded area which was repair-welded was found to have roughened due to erosion.
- (ii) Cladding thickness measurement at the nozzle ID & on shell junction in the approachable area was carried out. The report has been prepared.
- (iii) DP test of the flange face was carried out prior to machining, after weld-filling and also after final machining as a lot of undercuts in the weld deposit were observed which called for weld filling and remachining. Ferrite measurement was also carried out on welded area. Ferrite was found to be nil.

(c) V-1201, AUTOCLAVE :

Tray segments were removed from top to bottom for internal inspection of the liner, its weld joints and clit-weld joints. Thorough visual inspection and ultrasonic thickness measurement of the liner were carried out. The following are the observations:

- (i) The tray supporting cleats welding was found to be eroded/corroded at various locations. The spots needed to be repaired were marked. A comprehensive list of the defective cleat-welding and other observations was made and handed over to MM(Urea) and SE(Urea) for repairs. The same is listed below :

Tray no.
from top

OBSERVATIONS

1. Cleat no.1, as marked, was found broken. Four nos. tray fixing bolts and three nos. anchor bolts were found to be loose.
 2. Erosion on welding of Cleat no. 13 was noticed. Twelve nos. of tray fixing bolts were found loose.
 3. Erosion on welding of Cleat nos. 3, 9 and 10 was observed. Twelve nos. of tray fixing bolts were found loose.
 4. Welding of all the cleats was found to be satisfactory. However, Fourteen nos. of tray fixing bolts and three nos. of Anchor bolts were found loose.
 5. The overall condition of the cleat welding was found satisfactory. All the tray fixing bolts were found loose. Also, three nos. of anchor bolts were found loose.
 6. Erosion on welding of Cleat nos. 3 and 4 was noticed. Fifteen nos. of tray fixing bolts and Eight nos. of anchor bolts were found loose.
 7. Erosion on welding of Cleat nos. 4, 5 and 9 was observed. Twelve nos. of tray fixing bolts and Six nos. of anchor bolts were found loose.
 8. Overall condition of the cleat welding was found to be satisfactory. However all the anchor bolts were found loose and 14 nos. of tray fixing bolts were found loose.
 9. All the cleats welding was found satisfactory. However all the anchor bolts were found loose including Seven nos. of tray fixing bolts.
 10. All anchor bolts were found loose and Eight nos. of tray fixing bolts were found loose. Cleat welding was found satisfactory.
- (ii) The funnel plate weld joint on the West side was found eaten away at the top edge.
- (iii) Scattered erosion and uneven thick scaling was noticed on the top dished end around.
- (iv) Liner thickness measurement report has been prepared.

02 41 03 [C] MISCELLANEOUS JOBS:-

- (i) One no. Tee and an elbow each were replaced in HP line (PR-1208-4" from autoclave top to HP scrubber) at the HP scrubber top near RV-1201. DP test of edge-preparation, root, final run and radiography after the joints final welding were carried out. Report showing the thickness measurement data including those of the 'T' & bend is attached herewith. Severe Condensation-Corrosion 'channellings' were observed in the horizontal portion of the pipe (bottom-side) on which the valves are mounted. This portion of the pipe needs earliest replacement.
- (ii) V-1205 LP carbamate separator and H-1205 LP carbamate condenser drain line (2"Dia.) connected to ammonia water tank was visually inspected. A lot of cracks and leakage spots were observed at many places after filling water in it. The line was DP tested at suspected areas after removal of insulation. The defective pipe lengths were replaced with new one. DP test of the newly fabricated line joints was carried out. Report indicating the findings and exact length of the pipe replaced is attached.
- (iii) DP test and radiography of the field welds for hooking up of the Hydroliser system was also carried out.

02 41 04 [D] Thickness measurement of the following pipelines was carried out. The detailed report has been prepared.

Sl. No.	Line No.	Line Description
1.	PR-1208-4"	Autoclave top to Scrubber
2.	PR-1212-4"	Scrubber to Autoclave Bottom
3.	PR-1206-6"	} Flush Condenser to Rectifying Column.
4.	PR-1207-14"	
5.	PR-1215-16"	Rectifying Column to top of Recirculation heater.
6.	PR-1214-12"	Rectifying Column to bottom of Recirculation heater.
7.	MA-1201-3"	} Discharge line and recycle lines of Ammonia pumps A/B
8.	MA-1203-4"	

Sl. No.	Line No.	Line Description
9.	-----	Riser of H-1202 (East of 4 Ata Steam Drum, 3rd from North)
10.	-----	Riser of H-1202 (West of 4 Ata Steam Drum, 2nd from North)
11.	-----	23 Ata exhaust line of Q-1101-2
12.	-----	H-1201 Shell side condensate outlet to V-1502/V-1503
13.	-----	4 Ata Steam header to Q-1101-1
14.	-----	Riser of H-1202 (West side of 4Ata Steam Drum, 3rd from North)
15.	ST-1105-4"	60 Ata steam line to Q-1101-1
16.	-----	60 Ata steam line to Q-1101-2
17.	SC-1504-4"	9 Ata steam drum to 4 Ata steam drum condensate line
18.	PR-1204-8"	Bottom of HP condenser to bottom of autoclave. (Liquid line)
19.	PR-1203-8"	HP condenser to autoclave (Vapour line)
20.	PR-1224-3"	Discharge line of carbamate pumps to scrubber (H-1203) via HP Stripper (at some locations small surface cracks were observed on the pipe lengths as were earlier observed)
21.	-----	Discharge line of CO2 centrifugal compressor (10" Dia.)
22.	-----	60 ata steamline from old boiler to urea plant.
23.	-----	60 ata steamline on the pipe rack.

UREA PLANT

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CIVIL JOBS

<u>CODE NO.</u>	<u>JOB DESCRIPTION</u>
02 51 01 01	Grouting foundation near GHH Compressor and centrifugal compressor area.
02	Painting of Red mandana flooring G.F
03	Patch work repairs at Scraper floor by Araldite/Hardner & Silica.
04	Epoxy Epilux - 4 painting on Inside outside wall of prilling room, stair case, pramotograph room column & beams at prill tower top and inside of conveyor gantry - 2110.

UREA PLANT

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ELECTRICAL JOBS

CODE NO	JOB DESCRIPTION
02 61 01	Following jobs were done
01	Preventive maintenance carried out on transformer TR-7A, 7B and 17 :
	<ul style="list-style-type: none"> a) Checked and tightened connection at secondary and incoming of MCC switch gear. b) Reconditioned /replaced the silicagel in dehydrating breather. c) Tested the insulating oil for BDV values. d) Checked trip alarm circuit & cleaned all trip alarm boxes.
02	Carried out preventive maintenance of TMG/SIEMENS make LT ACBs installed at MCC-6 and 14.
03	Overhauled the following motors:
	<ul style="list-style-type: none"> a) P-1113-B, P-1123, P-1132-A, P1131-A, P-1231-A/B, P-1232-A/B, M-1402-1/2, E-1051, E-1053, K-1701, M-1702, K-1702, M-1701-1 / 2 / 3, M-1403-1 / 2, M-1421, E-1052, P-1124.
04	Carried out checking of terminal boxes of motors above 50HP for tightness of terminal & measured the IR values.
05	Checked all MLDBs, LDBs, SLDBs in the plant & replaced burnt out connector and rotary switches.
06	Checked all TPSOs and SPSOs in the plant and replaced the corroded ones.
07	Rerouted all cables on grill tower top on newly prepared M.S. cable tray.
08	Provided temporary connections of flood light, hand lamps, hydrojetting pumps in the plant.

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INSTRUMENT JOBS

JOB CODE	JOB DESCRIPTION
02 71 01	01 The following control valves were removed from line. They were completely overhauled, checked and put in line.
	i) PRCV-1201 : Plug, seat, lense ring, gland follower, and gland packing changed with new spares.
	ii) HICV-1202 : Plug, seat, gland packing, gland follower and diaphragm changed with new spares.
	iii) PRCV-1501 : Gland packing changed with new spare. Hand jack assembly overhauled.
	iv) LICV-1502A : Stem changed with new fabricaated stem in w/shop.
	v) LICV-1501 : Gaskets and gland packings changed with new spares. Lapping done on plug and seat.
	vi) LICV-1201 : Gland follower, gland packing gaskets changed with new spares. Five machine cut taken on plug.
	vii) TRCV-1422 : Gland packings, gaskets changed with new spares.
	viii) PICV-1502A : Gland packing, gaskets changed with new spares. Plug changed with a reconditioned spare.
	ix) FICV-1204 : Activator cylinder with 'O' rings, gland packing, gasket etc. replaced by new spares.
	x) HICV-1201 : Seat and lense ring changed with reconditioned spares. Air supply regulator relocated. Signal tubing done.
	xi) LICV-1101 : Hand jack assembly overhauled. PICV-1130 HICV-1221B
	xii) LCV-1123A : Gland packings, gaskets changed with new spares.
	xiii) LCV-1123B : Gland packings, gaskets changed with new spares. Metal filling and machining done on both plug & seat.

- xiv 40 ata steam valve GHH
Lube : Gaskets changed with new spares.
Oil Pump
- xv HICV 1022 : Body gasket changed with new spares.
- xvi TICV-1701 : V/P feed back lever changed with new fabricated spares in workshop.
- 02 i) Air supply regulator flushing, valve positioner cleaning and stroke checking of the following valves carried-out:

LRCV-1421, HICV-1421, TRCV-1421, HICV-1221 A/B, HICV-1222A/B, FRCI-1, HICV-1121, HICV-1022, HICV-1122, PICV-1202, FRCI-1421, FICV-1102, LCV-1101.
- ii) Gland packing and stroke checking of the following steam valves carried-out:

PICV-1128, PICV-1129, PICV-1130, PICV-1131.
03. Air supply regulator flushing and relay cleaning of the following level tools carried out:

LC-1123, LC-1501, LC-1502, LC1504, LIC-1501.
04. G.M counter removed from line. Each cross section of the tubes are checked with a point radioactive source and put in line.
05. Thermowall removed, inspected and put back. TI-1211 thermocouple replaced with new spare.
06. TIC-1101 Pneumatic control loop is fully converted into Mode-30 microprocessor based electronic control loop. Signal lables layed. I/P and temperature Tx mounted wiring and tubing done, powered up. Mode-30 controller configured and put in line.
07. P-1102 A Alarm/Trip switch box mounted. Wiring/tubing done, checked and put in line.
08. Two conductivity meters installed -

i) Final effluent of hydrolyser and

ii) 4 ata stean/condensate HP condenser sample coolers shell side cell, Tx, conductivity controllers mounted. Signal wiring and sample tubing done, powered-up and put in line.
09. LL-1102/LH-1102 of Ammonia receiver overhauled.

- 10 New 1/4" copper tubing done for all the instruments located on the third floor area.
- 11 Alarm/trip relays of compressor panel checked.
- 12 Important Tx's of the compressor area related with instruments all checked and calibrated.
- 13 Load test done on the back-up battery. Sp. gravity/Reading of the total set taken prior to discharge and after complete charging.
- 14 FS-1101 Turbine flow meter removed from line and the internals checked and found ok. Gaskets, changed with new space and put on the line.
- 15 PI-1122 impulse tubing changed into 1/2" S>S tubing.
- 16 FR-1201 1st isolation valve attended by Mech. Maint. IInd isolation valve replaced with new spare. Impulse tubing changed with 1/2" SS tubing.
- 17 Pneumatic junction box in the top floor near prilling room changed with new box. Tubing done and checked.
- 18 Vibration probes TI, PI gauges of compressor area removed and fixed back to facilitate mechanical maintenance. Probes changed with new spares wherever necessary. Centre of the float adjusted zero on the monitor.
- 19 HICV-1022, LH-1122, PICV-1202 removed from line to facilitate maintenance jobs and fixed back.
- 20 Following miscellaneous jobs carried-out :
 - i) Autoclave radioactive source removed from line and kept in the load container to facilitate maintenance jobs. Fixed back.
 - ii) T/c at HP condenser top. autoclave top removed to facilitate maintenance jobs and fixed back.
 - iii) Scintillation counter removed from autoclave top and kept in workshop.
 - iv) Weep hole connections removed from HP condenser bottom to facilitate maintenance jobs.
 - v) Inst. air connections provided at 23 ata steam drives and HP condenser to facilitate the inspection jobs.
 - vi) Extra inst. air supply points provided in the ground floor, as per requirement.

- vii) Tx mounting stand for new coming electronic Txs at FR-1201 provided and existing pneumatic Tx mounted on it.
- viii) Prill bucket speed cables disconnected and removed to facilitate electrical jobs and re-layed and connected back.
- ix) Replaced some M.S. trays by new since they were corroded.
- x) General cleaning and painting of all control valves and junction boxes carried out.

02 71 01 Following jobs were done.

- 01 PHA-1133, PHCO-1133 pressure switches shifted to comp. platform. Air regulator for PI-1133 TX shifted to comp. platform.
- 02 Discharge pressure gauge tubing of P-1106 A/B replaced and rerouted.
- 03 PI-1165 Air leak near air regulator attended.
- 04 PL-1165 overhauled and checked operation.
- 05 FICV-1203 control valve removed for inspection and fixed back. Stocking was also checked.
- 06 FIC-1203 Rotameter was removed for inspection. Float was found bend. It was repaired and fixed back.
- 07 FICV-1204 Control valve was removed for inspection and was fixed back.
- 08 FICV-1352 Control valve was removed for inspection and was fixed back.
- 09 V-1205 condensate rotameter shifted as per requirement of Production people.
- 10 V-1206 Ammonia water rotameter was cleaned.
- 11 LRCV-1421 TX was calibrated.
- 12 HICV-1122 Control valve action was checked.
- 13 HICV-1202 Stroke checking was done.
- 14 PI-1122 TX base plate was found broken. Replaced it from an old TX.

PLANT TURNAROUND - NOVEMBER 1992UREA PLANTTECHNICAL DEPARTMENT JOBS

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<u>CODE NO</u>	<u>JOB DESCRIPTION</u>
02 81 01	Following jobs were carried out.
01	Hook up of the Hydrolyser System and Plate Heat Exchangers and taking water run test of the system.
02	DM Water Heating system thru H-1207-A for its modified operation.
03	Installation of the strainers in cooling water inlet line for H-1207.
04	Installation of the vessel and piping for the HP Ammonia pump gland leakage.
05	Taking of the Tappings for the Urea plant drain collection system.
06	Tapping for the Ammonia Absorber V-1207

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OFFSITES AREA

MECHANICAL JOBS

JOB CODE	JOB DESCRIPTION
03 02 01	<u>BOILER FEED WATER PUMP TURBINE Q-5111</u>
	01 Inspected the bearings & clearances measured are as follows :
	Turbine thrust : 00.20 MM
	Journal Brg.clearance (coupling side) 00.27 MM (governor side) 00.26 MM
	02 Oil filters,console and coolers cleaned and Servoprime 68 oil changed.
	03 All steam leaks as per list attended.
03 02 02	<u>BOILER FEED WATER PUMP P-5111 :</u>
	01 Decoupled the pump from turbine.
	02 Checked bearings and coupling found in good condition.
	Clearance maintained are as
	Journal brg.clearance (Inboard) 0.12 MM (Outboard) 0.12 MM
	Thurst 0.50 MM
	03 Boxed up the bearing coverse & coupled.
	04 Oil coolers opened and cleaned.
03 02 03	<u>BOILER FEED WATER PUMP P-5112 :</u>
	01 Decoupled the pump from gear box.
	02 Checked bearings and coupling. Found in good condition Clearances are as follows :
	Journal Bearing (Inboard) 00.12 MM (outboard) 00.08 MM
	Thrust 00.50 MM
	03 Boxed up bearings and coupled with motor.
	04 Oil coolers opened and cleaned.

JOB CODE	JOB DESCRIPTION
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03 02 04 F.D.FAN TURBINE Q-5113 :

01 Inspection of bearings and clearances measured.

Pinion shaft

Journal bearing (Turbine side)	00.13 MM
(Fan side)	00.14 MM
Thrust	00.20 MM

Gear shaft

Journal bearing (turbine side)	00.08 MM
(Fan side)	00.10 MM
Thrust	00.20 MM

02 Opened oil cooler, cleaned & boxed up.

03 Cleaned filter & oil strainer

04 Clutch oil changed.

03 02 05 COOLING WATER PUMP P-4401/B & P-4401/D

OVERHAULING :

01 Decoupled the pump and removed casing.

02 Inspected rotor condition casing and neck rings. Both the shaft sleeves were observed to be worn out badly. It was decided to replace the rotor with reconditioned.

03 Changed both the journal bearings as the white metal lining was damaged.

Clearances are as under :

P-4401/B	P-4401/D
Inboard 00.009"	
Outboard 00.009"	- 00.011"

04 New gasket of 1.2 MM thickness champion style 20 provided and boxed up the casing.

05 New gland packing (25 Sq) provided.

06 Flushed gland cooling lines.

07 Replacement of suction elbow and suction reducer of cooling water pump P-4401/B carried out by M/s.CEDCO against WO No.D-8668.

 JOB CODE JOB DESCRIPTION

03 02 06 COOLING WATER PUMPS P-4401/A,P-4402 AND P-4403 :

PREVENTIVE MAINTENANCE

- 01 Decoupled the pumps and removed casing.
- 02 Inspected rotor condition,casing & neck rings. Found ok
- 03 Cleaned casings,gasket area & rotor manually
- 04 New gasket of 1.2 MM thickness champion style -20 provided and boxed up casing.
- 05 New gland packing (25 MM) provided.
- 06 Inspection of bearings.Replaced outboard bearing and thrust bearing (6318) of P-4402 as white metal lining was observed damaged. Clearances measured are as follows.

	P-4401/A	P-4402	P-4403
Inboard Brg. .011 - .012"	.012 - .014"	.009 - .010"	
Outboard Brg. .008 - 0.010"	.009"	.012" - .013"	

- 07 Replacement of suction elbow and reducer of P-4401/A carried out by M/s.CEDCO. Replacement of suction reducer of P-4402 & P-4403 carried out by M/s.CEDCO.

03.02 07 COOLING WATER PUMP TURBINE Q-4401/A :

OVERHAULING :

- 01 Decoupled the turbine and top casing was lifted after removing steam inlet line.
- 02 Checked the condition of rotor and oil guards.Replaced carbon rings.

Carbon ring clearances :

<u>Steam inlet end</u>			<u>Exhaust end</u>		
Carbon Ring ID (MM)	Clearance		Carbon Ring ID	celarance	
S1	107.18	00.012"	E1	107.15	00.010"
S2	107.18	00.012	E2	107.15	00.010"
S3	107.13	00.010	E3	107.10	00.008
S4	107.08	00.008	E4	107.10	00.008
S5	107.04	00.0065	E5	107.10	00.008
S6	97.03	00.006	E6	97.04	00.006
S7	97.03	00.006	E7	97.04	00.006

- 03 Overhauled governor,relay cylinder,emergency trip valve

JOB CODE	JOB DESCRIPTION
03 02 10	<u>RAW WATER PUMP P-4101/B</u> <u>OVERHAULING :</u> 01 Decoupled the pump from motor and removed casing. 02 Inspection of rotor - lot of erosion corrosion observed in impeller and shaft sleeves were found to have scoring. Hence it was decided to change rotor assembly. 03 Provided new gasket (2mm thick) and boxed up with new rotor assembly. 04 Provided new gland packings. 05 Coupled the pump with motor.
03 02 11	F-4206/A : Degasser Pump was overhauled
03 02 12	F-4418/B : Pump was overhauled.
03 02 13	<u>Q-4202 : DM WATER TURBINE OVERHAULING :</u> 01 Decoupled the turbine from pump and opened casing. 02 Inspected the condition of rotor. Journal bearing portion of the shaft was found to have scoring. Hence it was decided to replace the rotor with reconditioned rotor. 03 Both the journal bearings were observed damaged. hence replaced both journal bearings. Clearance maintained in journal bearings ie .006". Replaced thrust bearing 7207-A. 04 Replaced carbon rings.
03 02 15	01 <u>BOILER :</u> 01 One bank wall tube in BHEL Boiler plugged and tested by hydrotest at 90 Kg/cm ² , found okay. 02 Two (2) nos water tubes in old boilers No.F-5101/A were plugged and tested by hydrotest at 90 kg/cm ² and found okay. 03 Old boilers F-5101-A & B job attended as per job list.

JOB CODE	JOB DESCRIPTION
	04 Steam leaks and gland packing job done as per normal routine and as well as job list.
03 16 01	01 Strainer grills (03 Nos) provided in discharge channel of Ammonia C.T.basin. Also strainer grills provided in suction P-4418-A.
	02 Cation IV lateral supports of acid outlet header changed.
	03 All steam traps loops attended for leakages.
	04 Raw water tank cleaning related jobs done.
03 17 01	<u>VALVE JOBS :</u>
	01 Effluent Segregation valves (12" diaphragm valves) replaced.
	02 All cooling towers distributors headers valves overhauled.
	03 900 MM dia discharge valves of P-4401-A/B, P-4402, P-4403 preventive maintenance done.
	04 900 MM dia discharge valve of P-4401/C-D completely overhauled.
	05 Raw water suction valve of P-4101/B overhauled.
	06 Fire pump suction valves overhauled.
	07 Raw water tank foot valve (i.e. 8" 2 Nos and 3" dia x 2 Nos) overhauled.
03 20 01	<u>COOLING TOWER AREA :</u>
	01 Dewatering pump of new ammonia Cooling tower basin discharge line modification.
	02 Cooling tower area steam 3" dia vent line modification in Q-4401-A.
	03 C.W.Headers of Ammonia C.T.repaired by patch and painted.
	04 Chlorinator sparger in Urea C.T.basin changed.
	05 Suction line of raw water pump changed from FRP to CS.
03 31 01	<u>CONTRACTOR JOBS :</u>
	01 Cooling tower wood work Urea and Ammonia cooling towers, by Paharpur cooling towers, Calcutta.

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OFFSITE PLANTINSPECTION JOBS

JOB CODE	JOB DESCRIPTION
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03 41 01 01) BHEL Boiler :

During boiler startup water leakage was observed at front side of boiler (i.e. East side). On checkup, the leakage was found in the downcomer first tube from North end near the heat affected zone of the weld joint between the tube and side wall plate. The damaged tube was plugged at both the ends in steam drum and mud drum. The plugs seal weldings were checked by DPT.

02) Naphtha Storage Tank T-3301/B:

This tank was taken under maintenance for replacing the floating roof assembly with new one. Following inspection activities/checks were done and the details are as follows:

- (a) Visual inspection of the internals and thickness measurement of tank shell were carried out from inside.
- (b) Visually inspected all the circumferential weld joints and longitudinal weld joints of shell courses from inside. Overall condition of all the weld joints was found satisfactory. There was no pitting or corrosion on shell inside surface except thin rusting.
- (c) Thickness measurement of bottom bracing plates and float drums was carried out.
- (d) Weld joints of both the floats were checked by MPT and found satisfactory.
- (e) Weld joints of bottom bracing plates found to be fully coated with rust and deposits. In order to check the condition of weld joints, it was decided to clean the weld joints and heat affected zones (2" width of either side of the welds) by sand blasting. After sand blasting, the complete weld joints and HAZ were visually inspected. It was observed in most of the places the lap weld material was eaten away due to corrosion and rusting. In order to ensure

JOB CODE

JOB DESCRIPTION

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complete sealing and to strengthen these weld joints it was decided to slightly grind and reweld the corroded weak seal welding lap joints. Approximately 84 Mtrs length of weld joints was rewelded and checked by DPT before and after welding. Sketch 1 shows the exact location of repair welding carried out on the bottom bracing plate.

- (f) All nozzle weld joints were visually inspected from inside and also DP test was done where ever trace of corrosion or rusting was noticed.
- (g) A pinhole was observed in the inside parent plate of the pontoon on South side . The pinhole was repaired by welding and an additional patch plate was welded over the area. Welding was inspected by DPT.
- (1) All the weld joints of the newly fabricated pontoon was visually inspected and was found that the outside vertical plates circumferential bottom weld joints with deck (Single side fillet weld) from inside had insufficient deposit. Hence the complete circumference of the pontoon was rewelded. The joint was visually inspected and DPT was done wherever needed.
- (2) Visual inspection of the complete weld joints of floating roof both from top (i.e. outside) and from bottom (i.e. inside). Top side weldings were found to be in satisfactory condition. But, at the bottom side at the following places welding was not carried out properly and at some places no welding was done.
- (i) Nozzles of both the manholes were not welded from inside.
- (ii) Nozzles of both the automatic breather valves were not welded from inside.
- (iii) As per drawing the joints coming within a radius of 300 MM from any support shall be stitch welded at a pitch of 250 MM. This was not done. Hence, welding was carried out from inside of the roof plates wherever required.
- (iv) While on floating test some sweating leakage of water in the deck weld inside the pontoon was observed. This was also repaired by welding and DP test also carried out on it.

JOB CODE JOB DESCRIPTION

03) RAW WATER STORAGE TANK:

Visual inspection and thickness measurement of the fire pump and booster pump suction lines was carried out. The following are the observations.:

- (i) The protective coating on the wall of the tank was found peeled off at some scattered locations.
- (ii) The suction strainers of both the suction pipes in both the compartments were found badly rusted and damaged.
- (iii) The outer surface of the pumps suction lines were covered with thick coating of mud and dirt.
- (iv) Lot of sand was found accumulated at the bottom of the tank.
- (v) Ultrasonic thickness measurement of the suction pipings was carried out at few locations. The report has been prepared.

The above observations were intimated to Mgr(F&S) and also to Offsite maintenance for corrective action.

04) VERTICAL NaOH STORAGE TANK:

Old tank no. T-62 of Malathion plant was brought to Water Treatment plant and was rennovated for storage of NaOH. The old rubber lining was completely removed. After removal of the rubber lining the following inspection work was carried out.

- (i) Visual inspection of the shell, bottom plate and roof was carried out after sand blasting. The condition of the plates and weld joints was found to be satisfactory.
- (ii) Ultrasonic thickness measurement of the shell, roof and bottom plates was carried out. The detailed report has been prepared.
- (iii) Hydrostatic test of the tank was carried out after filling it with water.

Since the condition of the tank was found satisfactory, rubber lining of the tank inside was carried out. After putting rubber lining, the following inspection work was carried out.

- (i) Thickness measurement of the rubber lining was done.

JOB CODE

JOB DESCRIPTION

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- (ii) Hardness measurement of the rubber lining was carried out.
- (iii) Spark testing was carried out. Defective spots of lining were marked and repaired. Retesting of the rectified areas was carried out.

05)

Cooling water pump suction line elbows and reducers and Urea plant Cooling Tower return header fabrication work was carried out by contractors. DP test of the weld joints during fabrication and installation was carried out.

OFFSITE PLANT

CIVIL JOBS

CODE NO.	JOB DESCRIPTION
03 51 01	<u>COOLING TOWERS :</u>
01	Grouting of channel & structure for gate near Ammonia Cooling Tower.
02	Making pali near gate of Urea side cooling tower
03	Repairing and replacement of wooden platform and floor on channel, Sump of cooling tower.
04	Tapecrete coating and grouting of inlet pipe line of Ammonia side pump suction line.
03 51 02	<u>EFFLUENT TREATMENT PLANT :</u>
01	Acid/alkali proof brick lining on floor, inlet side wall and wall near strong effluent side (IInd bay)
02	Painting of wall Top and sides by Furen Resin Mortar.
03 51 03	<u>CHROMATE REMOVAL PLANT :</u>
01	Bitumastic lining on floor of chromate removal plant
02	Acid/alkali proof brick lining work on H2SO4 tank area
03	Making suction pit in chromate sludge sedimeantation tank near newly provided pump.
03 51 04	<u>NEW BOILER :</u>
01	Closing gap between two tubes & two rows in Superheater area
02	Floor repairs by refractory using brick
03	Manhole opening and closing
03 51 05	<u>WATER TREATMENT PLANT :</u>
01	Epoxy plaster by Araldite/Hardner & Silica on sides and bottom of weak effluent drain
02	Bitumastic lining on floor near PMB & SMB area.

OFFSITE PLANT
ELECTRICAL JOBS

CODE NO	JOB DESCRIPTION
03 61 01	Following jobs were done.
01	Carried out servicing of 66KV MOCB/OCB of BHEL make installed at 66KV sub-station :
	<ul style="list-style-type: none"> a) Replaced oil level gauge glasses and gaskets. b) Inspected fixed and moving contacts, closing & tripping mechanism. c) Replaced insulating oil duly filtered and checked for BDV values. d) Lubricated the mechanism and carried out adjustment for proper operation. e) Replaced the silicagel in dehydrating breathers. f) Provided sliding plate on main rod to avoid falling of foreign material into MOCB controller. g) Replaced ON/OFF indication glasses of all MOCBs.
02	Carried out raising of foundation level and reshuffling of busbars of MOCBs installed for Chhatral feeder(52-F) and TR-1B(52-G).
03	Carried out preventive maintenance of potential transformer for checking of oil, cleaning of bushing, top up oil in bushings, oil filtration for improving BDV values and replaced silicagel in breathers.
04	Carried out preventive maintenance of 66KV isolator, checking of alignment for proper opening and closing. Lubricated the mechanism.
05	Carried out cleaning of all the insulators installed on line, circuit breakers & transeformer for carbon and dust eposition.
06	Preventive maintenance carried out on transformer TR-2A, TR-2B, TR-3A , TR-3B , TR-4A , TR-4B , TR-8 , TR-9, TR-11, TR-12, TR-13, TR-14 ETC.
	<ul style="list-style-type: none"> a) Checked and tightened connections at secondary and incoming of MCC switch gears.

CODE NO

JOB DESCRIPTION

125

- b) Reconditioned/replaced the silicagel in dehydrating breather.
 - c) Tested the insulating oil for BDV values.
 - d) Checked trip alarm circuit & cleaned all emergency trip boxes.
 - e) Tightened bushing of TR-8 for oil leakages.
- 07 Carried out filtration of oil of TR-3A, TR-8, TR-13 AND TR-15.
- 08 Carried out preventive maintenance of 11KV switch gear, KIRLOSKAR installed at MPSS. Cleaned, tightened busbar connections and replaced wornout contact and defective parts.
- 09 Carried out preventive maintenance of AMF set and its control panel.
- 10 Carried out preventive maintenance of TMG/SIEMENS make LT ACBs installed at MCC-1, 2, 2A, 2F, 3, 8 and 11.
- 11 Overhauled the following motors :
E-5112 A / B , E-5111 A/B , K-5501 .
- 12 Checked all MOVs installed at Steam Generation Plant & rectified the defects.
- 13 Carried out checking of terminal boxes of motors above 50HP, for tightness of terminals and measured IR values.
- 14 Checked the terminal boxes of 1350HP H.T. motors, & replaced the burntout leads.
- 15 Checked all MLDBs, LDBs installed at plant.
- 16 Checked all SPSOs & TPSOs in the plant and replaced the corroded ones.
- 17 Provided temporary connections of flood lights, hand lamps in boiler and Water Treatment Plant.

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OFFSITE PLANTINSTRUMENTATION JOBS

CODE NO

JOB DESCRIPTION

03 71 01 D.M.WATER PLANT :

- 01 Cleaning,calibration of all control room receivers controllers, flow integrators,receiver switches etc. was carried out.
- 02 Overhauling of V/P Handjack assembly, Air regulator and stroke checking of the Raw water control valve was done.
- 03 Cleaning & calibration of all field controllers transmitters and all butterfly control valves was done.
- 04 Checking and cleaning and calibration of silica analysers was done.
- 05 General checking of panel wiring replacement of defective contactors,defective old solenoid valves with new ones, panel switches,wiring etc was carried out.
- 06 Replacement of defective corroded junction boxes was carried out for De-gasses level switches and D.M.Tank level switches.
- 07 Connection of new S.S.air header after teasting of leakage was done.
- 08 Tagging and proper painting of control panel instruments was done.
- 09 Replacement of corroded cable trays and erection of new cable trans was done in cation area.
- 10 All defective-obsolete bulb holders were replaced with new bulb holder and proper tagging was done.
- 11 The defective level switches of De-gasser were replaced by new one.
- 12 Replacement of defective pressure gauges, and installation flanges with new one was doone.
- 13 Replacement of defective instrument mounting support was carried out.
- 14 The raw water inlet flow orifice to cation units was removed from the line as per the requirement of production department, also removed Tx impulse lines and totalizer.

CODE NO

JOB DESCRIPTION

127

- 15 Cleaning, painting and replacement of defective pneumatic junction boxes was carried out.
- 16 Pneumatic multicore cable was laid in DM plant in Cation. Anion. Maxibed. Also the termination at both ends after installing pneumatic junction boxes.
- 17 Alkali rotameter was opened and overhauled.
- 18 Overhauling of DM plant control air regulators was carried out.
- 19 Removed the old timers, board etc. and removed Hooter installation.
- 20 Reinforced & replaced the supports of main air header supports also painting was done.
- 21 Painting of Raw water tank level scale, HCl tank level scale and various instruments was carried out.
- 22 Provided blind plate on the top of stream No. V control panel. Section in DM plant control room.

03 71 02 NEW BHEL BOILER

- 01 Reliability checking of UPS was done for 5 to 15 minutes it was found satisfactory.
- 02 Confirmed the switching of static switch & it was found OK.
- 03 Battery density, level checking was done & it was found OK.
- 04 Checking of BMS panel wiring and contactors was done.
- 05 Checking and cleaning of control room air regulators was carried out.
- 06 Flushing of furnace draft pressure tapping and high furnace pressure trip and alarm points was done.
- 07 Stroke checking of all dampers was carried out.
- 08 Inspection of one No. of EYE-HYE electrodes and its wiring was done. 1 No of electrode for - 4 indication was replaced and relay base pin was corrected, also wiring was checked.
- 09 Calibration of drum pressure gauges was done.
- 10 Checking of following level switches was done.
 - a) Drum level extra trip
 - b) Drum level low alarm
 - c) Drum level high alarm

CODE NO	JOB DESCRIPTION
11	All the swtiches were found alright.
12	Chcking of stroke, gland leakages, bonnet leakage, valve position cleaning,air regulaotr cleaning of following valve was done. a) 100% BFW control valve b) 30% BFW control valve c) TCV-1 & TCV-2 d) Atomising steam pressure control valve e) Oil pressure control valve f) Deaerator control valve.
13	Bottom flange of De-aerator control was leaking. It was attended, also stroke checking was done.
14	Bonnet of 60 to 14 Ata control valve was leaking, new gasket was provided and complete checking of the valve was done.
15	Checking of Ignitor system was done.
16	Removed all Temp. Indicators and F.D.fan speed sensor to facilitiatate Mech.Maint. job and refixed it.
17	General checking of BTVs, HOHTVs & limit switches etc was carried out.
18	Cleaned and calibrated the Deaerator instruments including control valves.
19	Replaced solenoid valve of BTV 2-2 as it was chattering too much.
20	Cleaned and calibrated local gas controller also replaced Flapper/nozzle assembly.
21	Provided approach platforms for oil flow transmitter and TCV-1 to facilitate maintenance work.
22	Isolated UPS and chnanged over pone to Aplab voltage stabilizer as powere supply was not available. Restarted UPS system as Electrical job in MCC was over.
23	V/P Handjack etc. of PICV-5151 and checked the stroke of the control valve.

03 71 03 COOLING TOWER

01	Cleaning of V/P handjack assembly and stroke checking of control valve. a) HICV-5153 (b) Sump level control valve c) HICV-5154 was carried out. Also painting of valves was done.
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CODE NO	JOB DESCRIPTION
02	Removaed all coupling of Tachometers of cooling water pump and checked and reinstalled it.
03	Stroke checking of H2SO4 control valve was done.
04	Cleaning of control panel and checking of panel instruments was done.
05	Calibration of sump level transmitter was done.
06	Installation of new stand for transmitter was carried out.

03 71 04 I.G.PLANT :

- 01 Attended all the start u jobs.
- 02 Refilled the electrolyte solution on O2 Analyser call chamber.
- 03 Checked the flame scanner operation.
- 04 Temperature controller was checked.

03 71 05 CHROMAE PLANT :

- 01 S.B.A. control valve cleaning and stroke checking was done.
- 02 Pit well control valve cleaning stroke checking was done.
- 03 Seperate tapping was provided for combined effluent pH meter for laboratory instrument.
- 04 Calibration and cleaning of all panel instruments was carried out.

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OFFSITE PLANT

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TECHNICAL DEPARTMENT JOBS

CODE NO

JOB DESCRIPTION

03 81 01 Following job was done.

01 Installation of pumps and piping for the chromate sludge
Removal system.

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PLANT TURNAROUND - NOVEMBER - 1992
BAGGING AND MATERIAL HANDLING PLANT
MECHANICAL JOBS

JOB CODE	JOB DESCRIPTION
04 02 01	<u>NAPHTHA FEED PUMPS - P-3302-A/B :</u> 01 Both the Naphtha feed pumps were opened and found Mechanical seal damaged. Changed the same with 1" dia Dura make new mechanical seal. 02 Bearing housing of both the pumps opened and reconditioned the same by changing bushes and bearing. (Angular contact Ball bearing 7213 FEP) 03 Pumps were tested and found okay
04 03 01	<u>DUST SYSTEM BLOWER AT SILO :</u> 01 Cleaning of blower done. 02 Provided tapping for vaccum guage in suction of blower
04 03 02	<u>DUST SYSTEM BLOWER AT HOPPER FLOOR :</u> 01 Cleaning of blower done. 02 Changed the coupling. 03 Provided tapping for vaccum gauge in suction of blower
04 03 03	Opened the line for cleaning & boxing up of the same was done.
04 03 04	<u>DUST SOLUTION LINE IN BAGGING PLANT :</u> Laying of S.S. 2" dia pipe line in dust extraction system was carried out and provided connection for D.M. Water and Urea solution line in Urea plant. This is approximate 620 mtrs. of line and was carried out by M/s. Ansh Engineer kalol against contract.
04 17 01	<u>BALL VALVES :</u> Reconditioning of 6" dia , 4" dia, 1 1/2" dia Ball valve was done and tested.

JOB CODE

JOB DESCRIPTION

132

04 21 01 PLANT TRANSFER CONVEYOR M-2110 :

- 01 Checking of all bearings and it was found in good condition. It was greased properly.
- 02 Checked return rollers and changed the damaged rollers.
- 03 Checked and freed jammed rollers and changed damaged rollers.
- 04 Gear box overhauled (6" FSS), checked all the parts flushed with oil, reassembled and boxed up.
- 05 Changed the coupling bushes.
- 06 Checked the condition of belt and found bottom ply at so many places has come out, Repairing of 2 Nos joint was carried out by M/s.Jagruti Rubber Enterprise, Ahmedabad.

04 21 02 FRESH UREA SHUTTLE CONVEYOR M-2121 :

- 01 Changed the damaged return roller.
- 02 Complete overhauling of gear box 9" FSWR was done. Every thing was OK.
- 03 Changed the coupling bushes.
- 04 Checked the belt and it was found ok.
- 05 Greasing of all the bearings was done.
- 06 Pulley tail end side changed due to wearing of bearing portion of shaft.

04 21 03 TRIPPER UNIT ON M-2112 - (M-2114) :

- 01 Cleaning & greasing of bearings of tripper unit done.
- 02 Back wheel assembly (Malathion side) is taken out to our maintenance shop for changing the bearings. Changed the 2 Nos. bearings with RHP-60 Block No.8 and wheel distance is compressed to 1440 which was earlier about 1460 MM. Completed the assembly and installed on the tripper. Tested the tripper throughout the length of Silo. No slippage of wheel observed.
- 03 Alignment of tripper pulley with respect to belt was carried out and rectified the same.

04 21 04 RECLAIM CONVEYOR M-2117 :

- 01 Reconditioning and replacement of return rollers.
- 02 Freed jammed carrying rollers.

JOB CODE

JOB DESCRIPTION

133

03 Checked bearings and greased the same. On bearing of bend pulley size 50 MM changed.

04 Gear box 12" FSWR overhauled and checked to find it all right.

05 Coupling bushes changed.

04 21 05 BAGGING FEED CONVEYOR M-2121 :

01 All the jammed carrying rollers freed and damaged rollers changed.

02 Reconditioning and replacement of return rollers done.

03 Checking of all the bearings done and greasing of the same was carried out.

04 Gear box 12" FSWR overhauled and checked too. Found all right.

05 Coupling bushes changed.

06 Belt condition checked and found okay.

04 21 06 BAGGING HOPPER FEED CONVEYOR M-2122 :

01 Replaced 5 mtrs. damaged portion with new one by making 2 Nos diamond joint. Work was done by M/s. Jagruti Rubber Enterprise, Ahmedabad.

02 Gear box overhauling done.

03 Changed the bushes of couplings.

04 Bearings checking and greasing.

04 21 07 DIVERTER PLOUGH TRIPPER M-2122 (M-2123) :

01 Diverter to hopper No.3 repaired for its smooth operation.

02 Gear box overhauling done.

03 Checking of bearing and greasing done.

04 31 01 NAPHTHA TANK T-3301/B :

01 Changed the floating roof of Naphtha tank by newly fabricated one and tested hydraulically to find it all right for use. The job was carried out by M/s. CEDCO, Baroda against contract.

02 All the slewing joint of suction line and roof drained line opened and rectified.

JOB CODE	JOB DESCRIPTION
03	Vaccum breather valve opened and rectified.
04	Changed the Ball Valves 6" dia, 4" dia and 1 1/2" dia with reconditioned and new one. (4" dia - 2 Nos, 6" dia - 1 No old reconditioned 1 1/2" dia new, 2" dia new)
05	Provided 2" dia, 1 1/2" dia, 4" dia & 6" dia blinds in the Naphtha system wherever it is required.

04 31 02 AMMONIA INTERMEDIATE STAGE COOLER :

- 01 Cleaning of cooler by Hydrojetting was carried out.
- 02 Testing of any possible tube leakage was done.

04 31 03 REFRIGERATION COMPRESSOR OIL COOLER :

Cleaning of cooler by Hydrojetting was carried out.
 Heat exchangers were hydrojet cleaned. (Party M/s.Nutech Jetting).Details of time taken for cleaning by hydrojetting are given below. This includes administration Air conditioning unit coolers etc.

SR.NO.	EQUIPMENT	T I M E		M/C
		HRS	MIN	
01	K-3101 Oil cooler Ammonia inter mediate stage (Total 2 Nos)	5	00	Diesel
	Administration Airconditioning Unit coolers (2 Nos)	1	45	Diesel

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BAGGING & MATERIAL HANDLING PLANT

CIVIL JOBS

CODE NO.	JOB DESCRIPTION
04 51 01	<u>NAPHTHA TANK T-3101/B :</u>
01	Sand blasting on bottom plate of Naphtha Tank for inspection purpose.
02	Epoxy painting on inside surface of walls and ceiling at all floors of Silo
03	Bitumastic lining on floor of conveyor gantry 2121 & 2110 and repairing work at Top floor of Silo
04	Tapcrete water proofing on wall & floor of 2121
05	Epoxy painting on inside surface of 2121 (20 Mtr length)
06	Epoxy painting and Monolithick plaster in beam, columns slab and floor of packer scale.
07	Fixing of windows shutter at Bagging floor
08	Repairing by concreting and plastering of platform
09	Cutting of scrap conveyor rubber belt and placing on working floor Packer Scale.
10	Acid/alkali proof brick lining work on floor and curbing of dust removal plant over empty bags store area.

CODE NO

JOB DESCRIPTION

137

- 10 Carried out checking & overhauling of Tripper control boxes, cable drum ,Reclaim control panel.
- 11 Provided additional tube light fitting in reclaim control panel for better illumination.
- 12 Overhauled/replaced all local ON/OFF push button stations of all conveyors.
- 13 Removed all extra push button stations on all conveyors.
- 14 Overhauled the following motors:
M-2110, M-2116-1/4, M-2121, M-2117, M-2122, M-2112

PLANT TURNAROUND - NOVEMBER - 1992

BAGGING & MATERIAL HANDLING PLANT

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INSTRUMENT JOBS

CODE NO	JOB DESCRIPTION
04 71 01	<u>STORAGE AREA :</u> <u>OLD NH3 STORAGE TANK :</u> 01 Level indicator counter assembly along with head was replaced. 02 Provided protection for instruments line as logging material is falling from the tank.
04 71 02	<u>NEW NH3 STORAGE TANK :</u> 01 Separated 440 V A/C power termination from control panel to outside junction box. 02 Attended flare stack as it was not lighting up along with suppliers representative.
04 71 03	01 Replacement of defective junction boxes for proximity switches was done. 02 Cleaning, calibration of all Libra Electronic digital weighing machine was carried out. Also painting of platform was done. 03 Overhauling of solenoid valves, contactors, timers etc. for machine No. 1,2,3,4,7 & 8 was done. 04 Calibration of machine No. 1,2,3,4,7 and 8 was done. 05 Cleaning and painting of solenoid boxes was done. 06 Cleaning of belt weighting system was done. 07 Provided vacume gaugs/manometer of tapping points.